26 January 2011

Coping with the Causes of Climate Change

Renewable Energy Policies in Germany and European Union

Moving towards a gradual decarbonisation of the energy economy by 2050 with a fourth green sustainability revolution

Hans Günter Brauch

Privatdozent, Free University Berlin, Otto-Suhr-Institute

Senior Fellow, (UNU-EHS), Bonn

Chair, Peace Research and European Security Studies

Editor, Hexagon-Book Series on Human, Environmental Security and Peace, Springer Publishers

UNITED NATIONS UNIVERSITY
UNU-EHS
Institute for Environment and Human Security

Freie Universität Berlin

AFES-PRESS

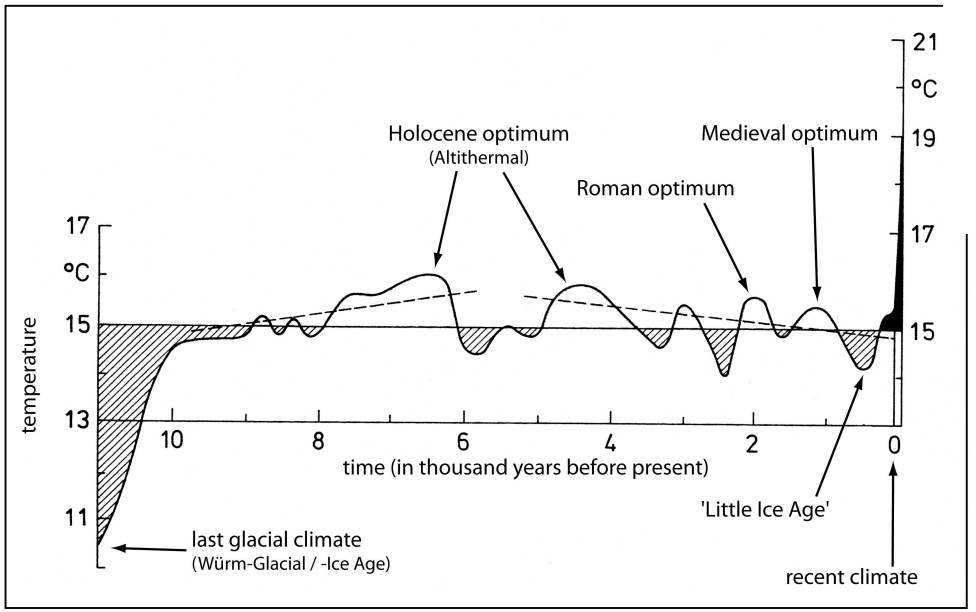
Contents

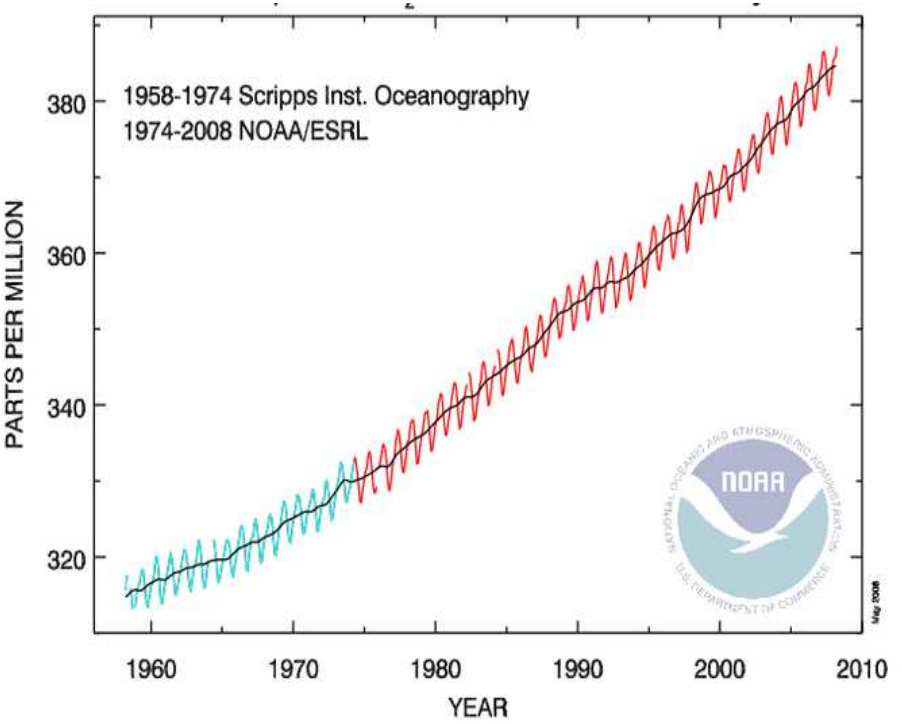
1. Challenge of Global Climate Change and Policy Commitment of the G-8

- **We are confronted with a paradox:**
  - Global consensus (AR4, IPCC 2007) that climate change is largely anthropogenic
  - Policy consensus to stabilize temperature increases due to GHG emissions at 2℃ above preindustrial levels (280ppm,1750) by 2100 at 450 ppm.
  - Commitment by G-8: reduce GHG emissions (2050) globally by 50%, for industrialized countries by 80%
- **But multilateral climate negotiations failed in Copenhagen (2009) and Cancun (2010) to adopt a legally binding Post-Kyoto Strategy**

1.1. There is a consensus that climate change is largely anthropogenic

IPCC in Assessment Reports (1990, 1995, 2001, 2007): since industrial revolution climate change has been anthropogenic





GHG in the atmosphere

1750: 279 ppm, 1987: 387 ppm

1/3: 1750-1958: 279 to 315 ppm

2/3: 1958-1987: 315 to 387 ppm

1.2.G-8 agreed to reduce GHG emissions by 2050 for industrial countries by 80 %

- G8 (Britain, Canada, France, Germany, Italy, Japan, Russia, US) agreed in 2007 (Germany), 2008 (Japan), 2009 (Italy) and 2010 (Canada)
  - 50% reduction of GHG emissions by 2050
  - 80% for industrialized countries
  - US$ 10 billion/year climate technology & research.
- They differed on year of reference 1990 or later
- No agreement on legally binding targets

1.3. Policy consensus to stabilize temperature rise 2℃ above preindustrial levels by 2100

Copenhagen Accord agreed (COP 15, 2009)

„…we shall, recognizing the scientific view that the **increase in global temperature should be below 2 degrees Celsius**, on the basis of equity and in the context of sustainable development, enhance our long-term cooperative action to combat climate change.“

But legally nonbinding reduction obligations

Cancun Agreements (COP 16, 12.12.2010):

- Industrialised country targets are officially recognised and these countries are to develop low-carbon development plans and strategies …..
- **Clean Development Mechanisms** has been strengthened ...
- A total of $30 billion in fast start finance from industrialised countries to support climate action in the developing world up to 2012 and the intention to raise $100 billion in long-term funds by 2020 is included in the decisions.
- In the field of climate finance, a process to design a **Green Climate Fund** under the Conference of the Parties, with a board with equal representation from developed and developing countries, is established.

1.4. Failure of Climate Negotiations to Adopt Post Kyoto Regime

- Obstacles in major industrialized countries due
  - Economic opposition of interest groups (lobbies)
  - Short-term interest of policy makers (re-election)
  - Lack of public awareness partly due to manipulation of media
- Lack of political will of some parliaments to adopt policies (in USA)
  - Bush Administration adopted 50-80 reduction goals
  - But no legally binding reduction targets for US
  - Obama: proposal -17% (now), -5% (1990)until 2020

1.5. Two Opposite Visions

Anthropocene Two Ideal Type Future Visions:

- ***Business-as-usual*** where economic and strategic interests and behaviour prevail leading to a major crisis of humankind, in inter-state relations and destroying the Earth ('security' and 'market first' scenarios, UNEP 2007)
- The need for a ***transformation*** of global cultural, environmental, economic (productive and consumptive patterns) and political (with regard to human and interstate) relations ('sustainability first' scenario, UNEP 2007).

1.6. Two Alternative Strategies

Both visions refer to different coping strategies :

- Vision of ***business-as-usual*** suggests primarily technical fixes (such as geo-engineering, increase in energy efficiency or renewables), defence of economic, strategic and national interests with adaptation strategies that are in the interest of and affordable for the ‘top billion’ of OECD countries.
- Alternative vision of **comprehensive transformation** a ***sustainable perspective*** has to be developed and implemented into effective new strategies and policies with different goals and means based on global equity and social justice.

1.7. Paradigm for Global Sustainability

- **Alternative vision** refers to a “new paradigm for global sustainability” (Clark/Crutzen/Schellnhuber 2004)
  - **Changes in technology and management systems alone will not be sufficient**, but “**significant changes in governance, institutions and value systems**” are needed, resulting in a fourth major transformation after “the stone age, early civilization and the modern era”.
  - These alternative strategies should be **“more integrated, more long-term in outlook, more attuned to the natural dynamics of the Earth System and more visionary**”
  - These many changes suggested above by natural scientists require a **‘Fourth Green Sustainability Revolution’.**

1.8. Decarbonization of the Economy

Sustainability Revolution in Energy Sector

- **To achieve the goals of a 80% reduction of GHG emissions in 40 years requires:**
  - Changing mindsets of policy makers and worldviews of scientists and opinion leaders and governance structures
  - Implementing commitments (difficulties in many industrialized countries, e.g. in the US, Canada, Australia)
  - Develop binding national policies and their implementation
  - Initiating bold scientific research programmes with a goal:
    - Enhance energy efficiency
    - Shift from carbon to renewable energy sources
- **This must lead to a decarbonization of the economy (especially of the energy sector)**
- **For many natural scientists: This requires a fourth sustainability revolution!**

1.9. Change is Possible and Beneficial

- **Change is not for free:** requires major policy efforts that require large investments
- **But such a change is possible and beneficial by**
  - Creating new jobs in research, industry, services;
  - Reducing the energy costs increasing industrial competitiveness of products and processes.
- **3 Examples**
  - Germany: from a latecomer to a leader on renewables;
  - EU: political will to implement binding reduction goals for 27 countries by 2020;
  - Industry‘s readiness to enter into a major investments (Solar Plan, DESERTEC Industrial Initiative.

2. The German Experience: Moving towards Renewable Energy

- From a Latecomer to Frontrunner (1990-2010)
- **Legal Basis of Commercialization:**
  - 1990: Electricity Find in Law (launched process)
  - 2000: Renewable Energy Law (intensified it)
- **Politics:** Consensus on climate change and renewables, dispute on nuclear energy
- **Implementing: Kyoto Protocol and EU goals**
- **Research spending: major increase 20 years**
- **Economic Impact:** ca. 350.000 new jobs(2010)

2.1 Legal Basis for Promotion of Renewables in Germany (1990-2010)

- **1991: Electricity Feed-in Law** (Chancellor Kohl) legal basis for wind industry to feed into the grid at a higher than market price (subsidized by energy consumers), primarily for wind power
- **2000: Act Granting Priority to Renewable Energy Sources (EEG)** (Chanc. Schröder): operators of plants generating electricity from renewable energy sources are entitled to a fixed compensation for electricity fed into the grid from grid operator (included geothermal energy)**.100,000 Roof Programme (PV)**
- **2004:** Reduction for subsidies for wind power**,** increased subsidies for photovoltaic solar energy
- **2009: (**Chanc. Merkel) goal to increase RE 30% of electricity generation by 2020 and for solar thermal (heating systems), degression of subsidies for PV
- **2011:** reduction of subsidies for PV by 9-13%.

2.2. Economic Instrument: “Feed in Tariffs”

- Certificates of renewable energy (environmental attributes)
- Incentives based on production
- Incentives based on capacity
- Policy of fixed prices
- Incentives based on real costs of renewable energy
- Tariffs of RE
- Costs (in real time per site; long-term projections for enterprises
- Fiscal credits for investments
- Fiscal credits for production

2.3. Politics: High Consensus on Climate Change and Renewables

- **Despite many disputes on details, there was a high level of support for climate change goals and renewable energy since 1990**
- Chancellor **Kohl** (1983-1997): cons., liberal
- Chancellor **Schröder** (1997-2005): left, green
- Chancellor **Merkel** (2005-2009): cons., left
- Chancellor **Merkel** (2009-): cons., liberal
- Major dispute on nuclear energy (1997-today)
  - Schröder for moving out of nuclear energy by 2020
  - Merkel postpone running time for reactors to 2030s.
  - **Part of profits of electricity companies for renewables!**

2.4. Implementing GHG Reduction Goals

- Preparation: Parliamentary Commission on Climate Change (1987-1990, 1991-1994)
- Pioneer: Environment Ministry: Töpfer/Merkel
- Initial goal: -25% by 2005, later by 2010 (1990)
- COP 1 (1995) in Berlin: Berlin Mandate
- COP 3 (1997) in Kyoto: -5,1% (2008-12) (1990)

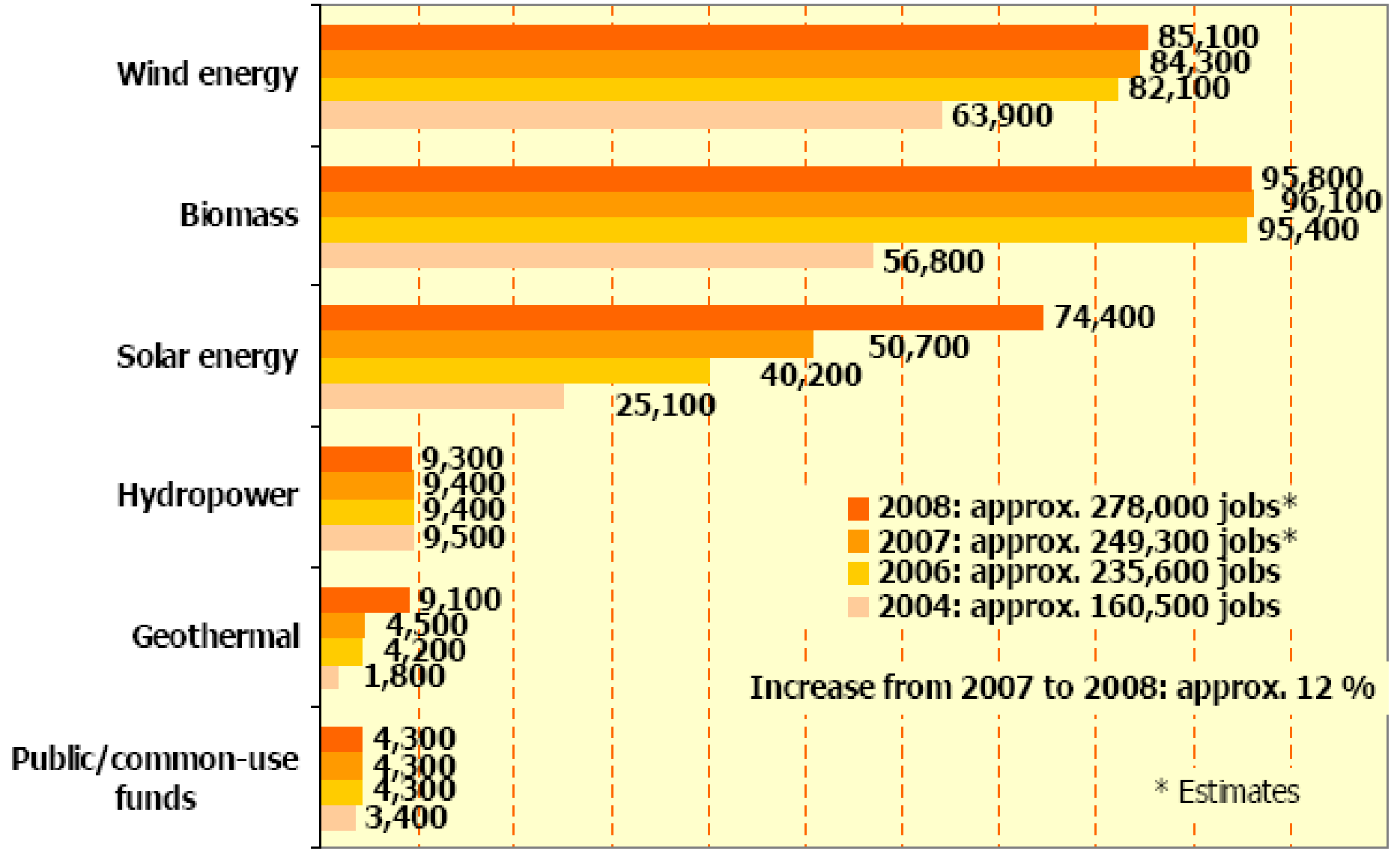
EU goals (solidarity principle): Germany – 21%

By 2007 (a reduction of 20% was achieved)

2.5. Second Integrated Climate and Renewable Energy Package (2008)

- 7 acts & ordinances: increase energy efficiency:
  - **Energy Conservation Act and Energy Saving Ordinance**
  - **Energy Grid Expansion Act**
  - **Act on the Levying of Distance-Related Charges for the Use of Fe-deral Motorways by Heavy Goods Vehicles/Toll Level Regulations**
  - **Ordinance on electricity and gas meters**
  - **Amendment to Heating Costs Ordinance**
  - **Key elements for changing basis of vehicle tax**

2.6. Development of Jobs (2004-2008

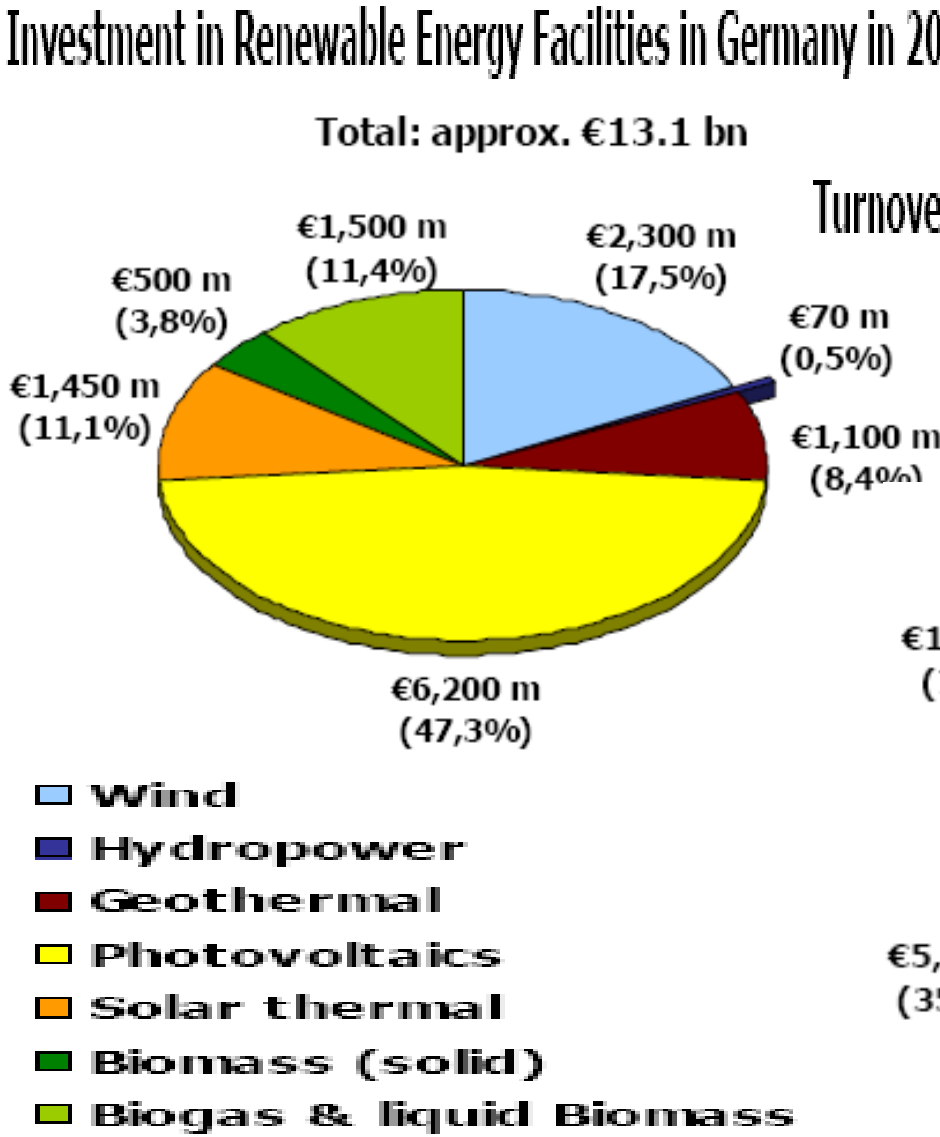


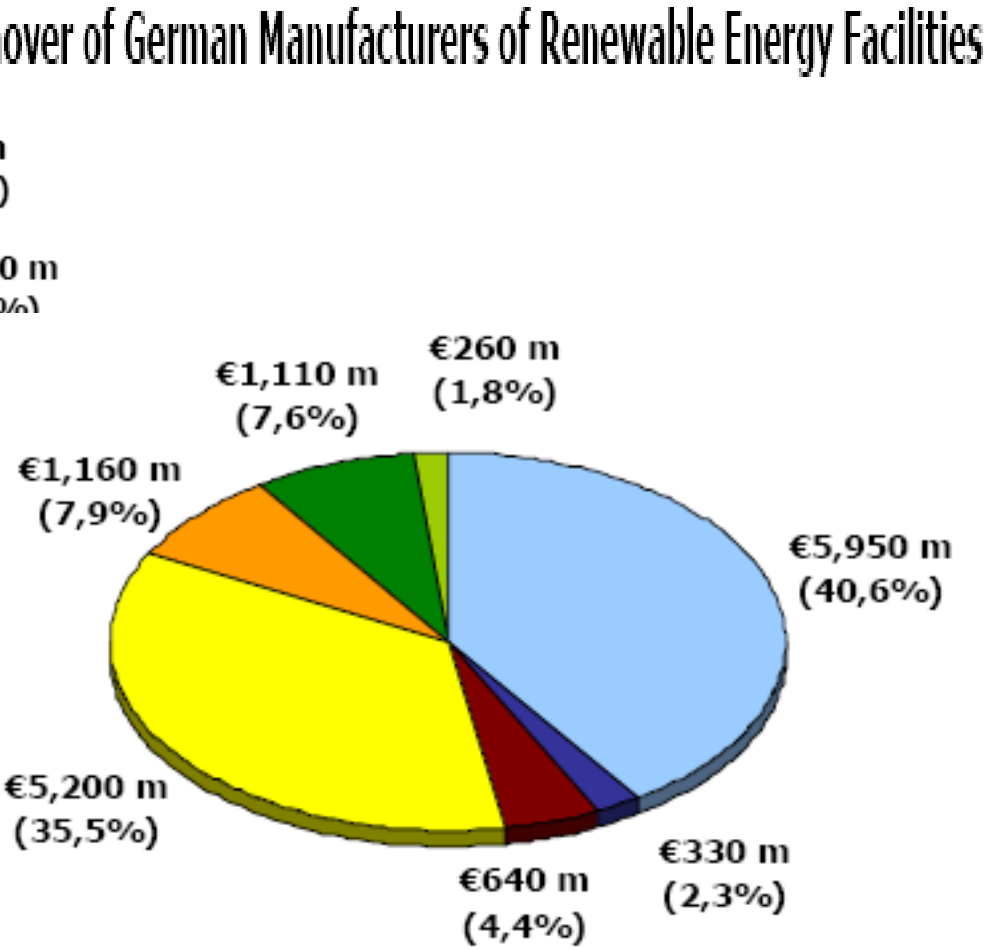
2.7. Jobs in Renewable Energy Sectors

Table 1: Employment from Renewable Energy in Germany 2008.

	Employment from investment (incl. export)	Employment from operation & maintenance	Employment from supply of biomass	Total employment 2008	Total employment 2007
Wind	68,100	17,000		85,100	84,300
Photovoltaics	54,700	2,300		57,000	38,600
Solar thermal	15,500	1,900		17,400	12,100
Hydropower	4,900	4,400		9,300	9,400
Geothermal	8,600	500		9,100	4,500
Biomass	15,200	19,500		34,700	31,300
Biogas & liquid Biomass	3,400	4,000		7,400	13,500
Biomass for power			28,500	28,500	22,800
Biomass for transport			25,200	25,200	28,500
Total	**170,400**	**49,600**	**53,700**	**273,700**	**245,000**
Employment from the use of public and common-use funds				4,300	4,300
Total				**278,000**	**249,300**

2.8.Investment and Turnover (2008)





2.9 Renewable Energy Achievements & Goals (2009)

- According to estimates by WG on Renewable Energies Statistics, renewables enable **savings of roughly 115 million tonnes of CO** per year in Germany **- 57 million tonnes as a result of the Renewable Energy Sources Act.**
- Share of 10% in final energy consumption, renewables became a key pillar of sustainable energy supply. They have a share of 14.8 % in gross electricity consumption and 7.7% in heat supply
- 2008: Investments & revenues from plant operations rose to ca. 30 billion € ca. 4.5 billion more than in 2007.
- Ca. 13 billion €, investments in plant construction increase by 20% (2007)

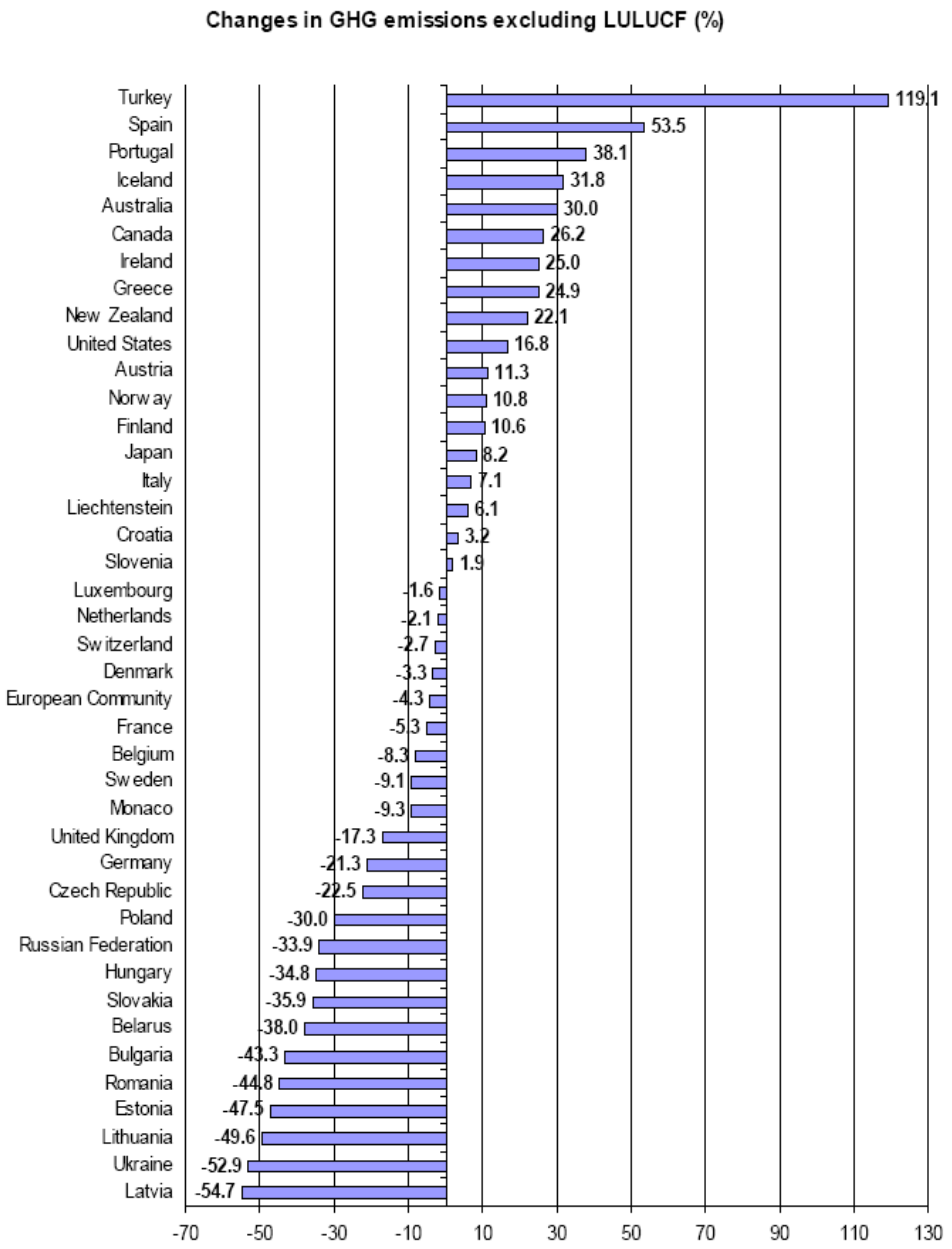
Goal of Renewable Energy Package (2008)

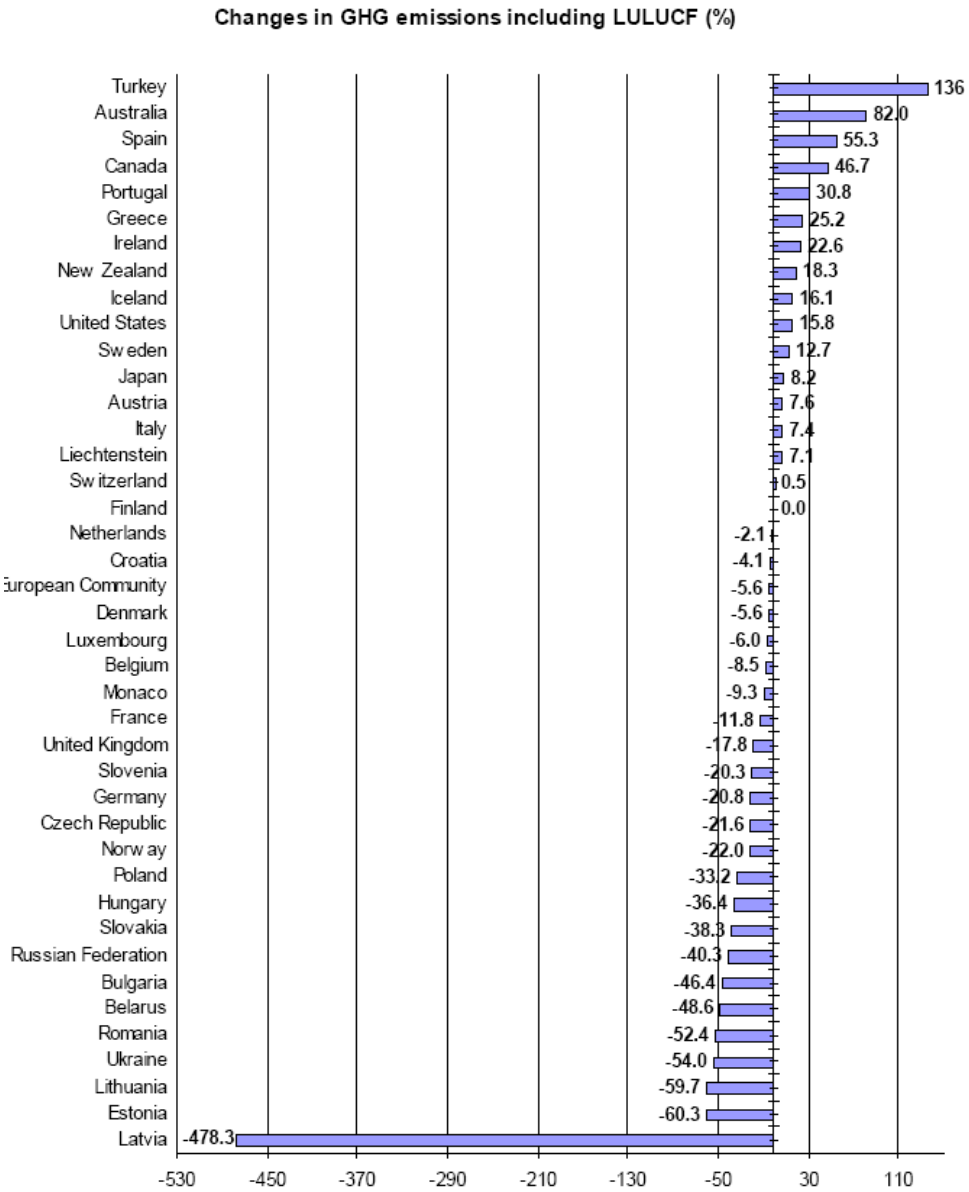
- **Aim is to better use of renewables and energy efficiency and move away from oil and gas.**
  - **Create more than 500,000 additional jobs by 2020.**
  - **Increase energy efficiency by ca. 30 % (buildings)**
  - **Reduce GHG by 40% until 2020 (based on 1990 GHG emissions)**

3. European Union: Goals and Commitments Until 2020

- **Achievements of Kyoto Goals of EU countries according to internal division**
- **EU Climate Policy Goals for 2020:** (2013ff.)
  - 20 % GHG reductions by 2020 (by 30% if other countries make major commitments)
  - **20 % increase in energy efficiency**
  - **20 % share of renewables**
- EU Green Paper on Renewables
- EU Union for the Mediterranean: Solar Plan

3.1. EU GHG Emission Reductions





3.2. EU Renewables Policy Goals for a Sustainable Energy Policy by 2020

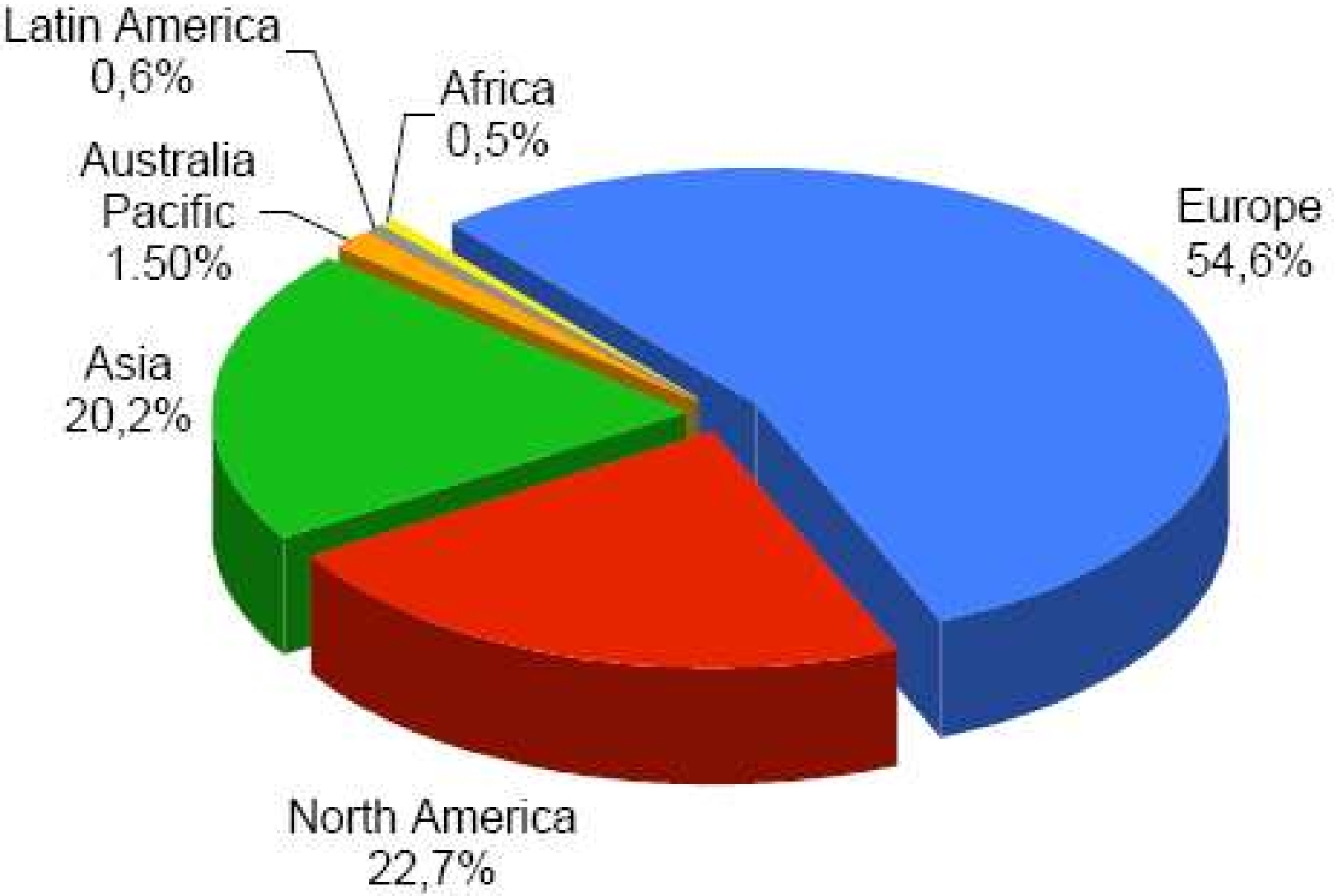
New Energy Strategy Focuses on Five Priorities:

1. **Achieving an energy-efficient Europe (4 key actions)**
   - **1: Tapping biggest energy-saving potential (buildings, transport)**
   - **2: Reinforcing industrial competitiveness by making industry more efficient**
   - **3: Reinforcing efficiency in energy supply**
   - **4: Making the most of National Energy Efficiency Action Plans**
2. Building a truly pan-European integrated energy market;
3. Empowering consumers, highest level of safety and security;
4. Extending Europe's leadership in energy technology/innovation;
5. Strengthening the external dimension of the EU energy market.

International and interregional Policies:

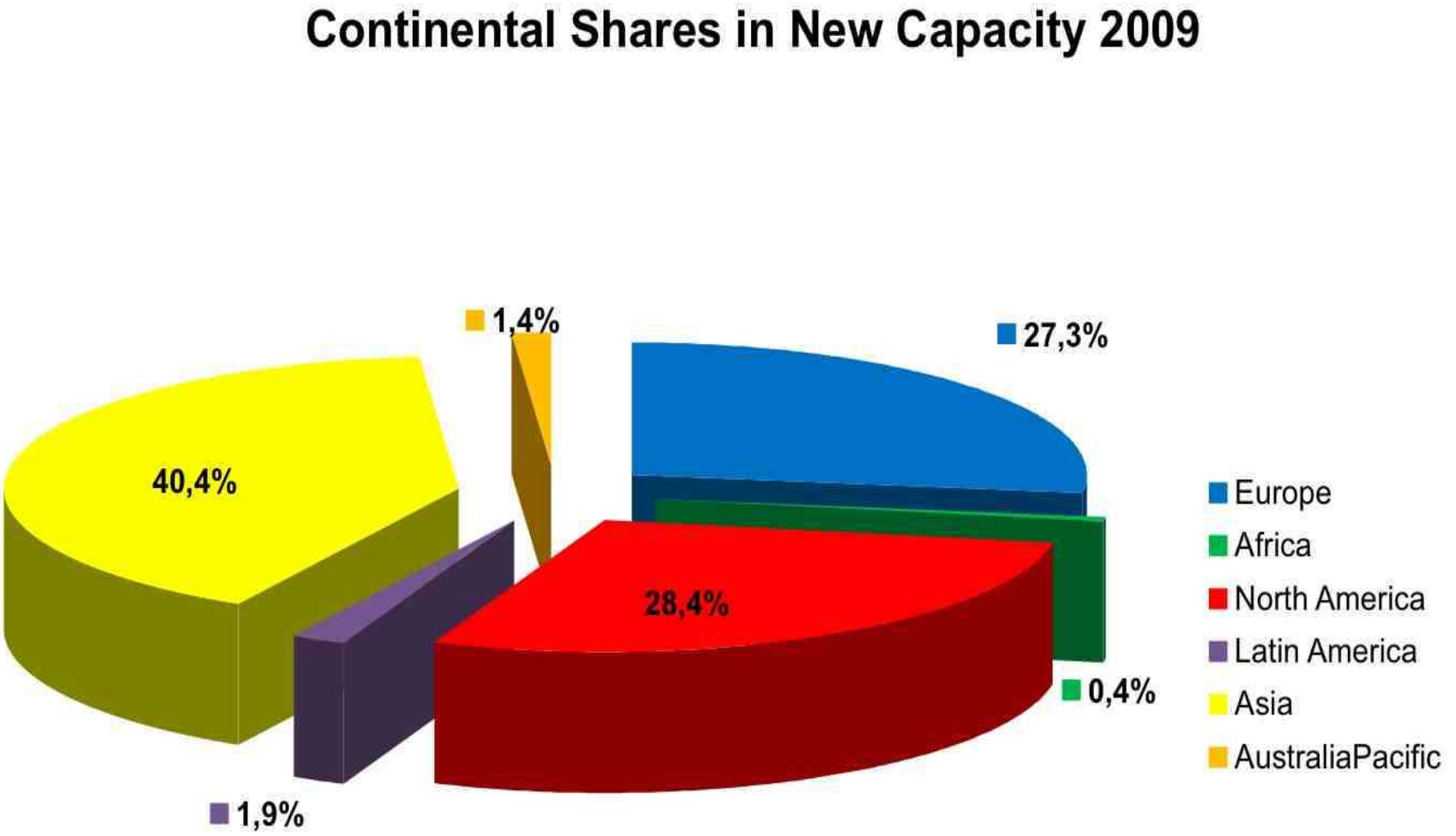
- **Barcelona Process (Union for the Mediterranean)**
- **Cooperative Projects (Research, Development)**

3.3. Continental Shares of Total Globally Installed Capacity of Renewables



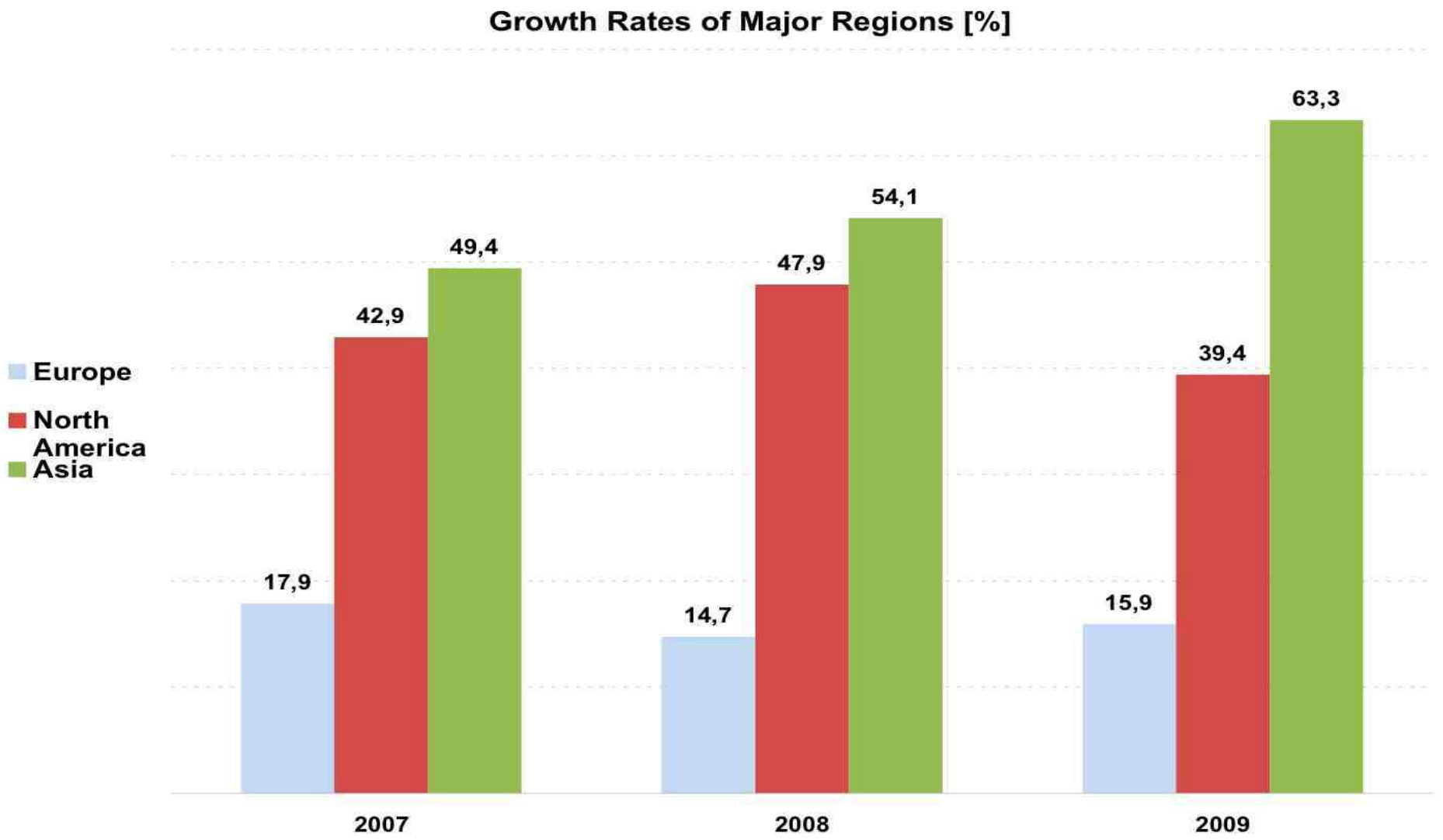
3.4. Continental Shares of Wind

Source: World Wind Energy Report 2009 (10 March 2010)



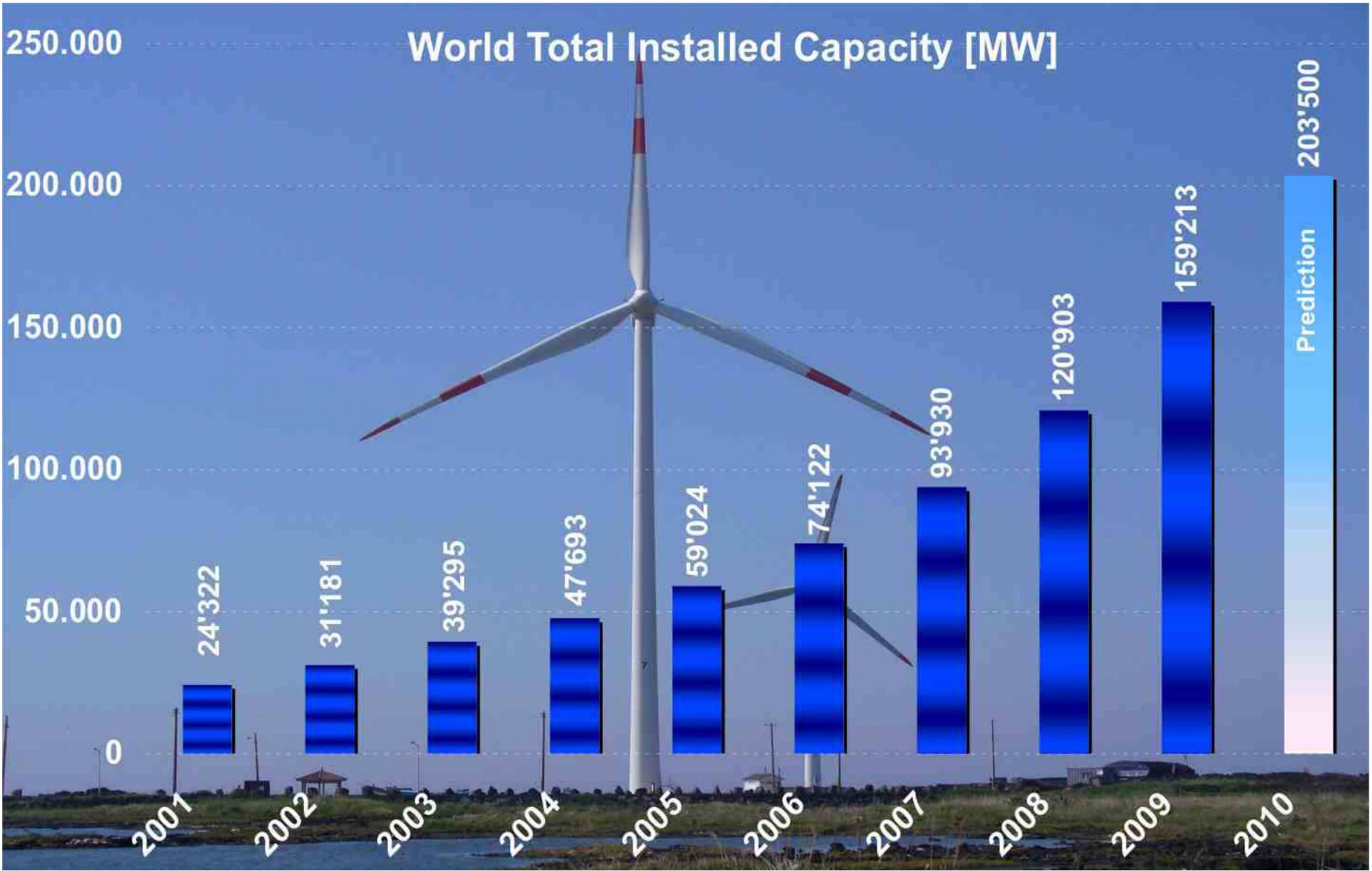
3.5. Growth Rates of Regions

Source: World Wind Energy Report 2009 (10 March 2010)



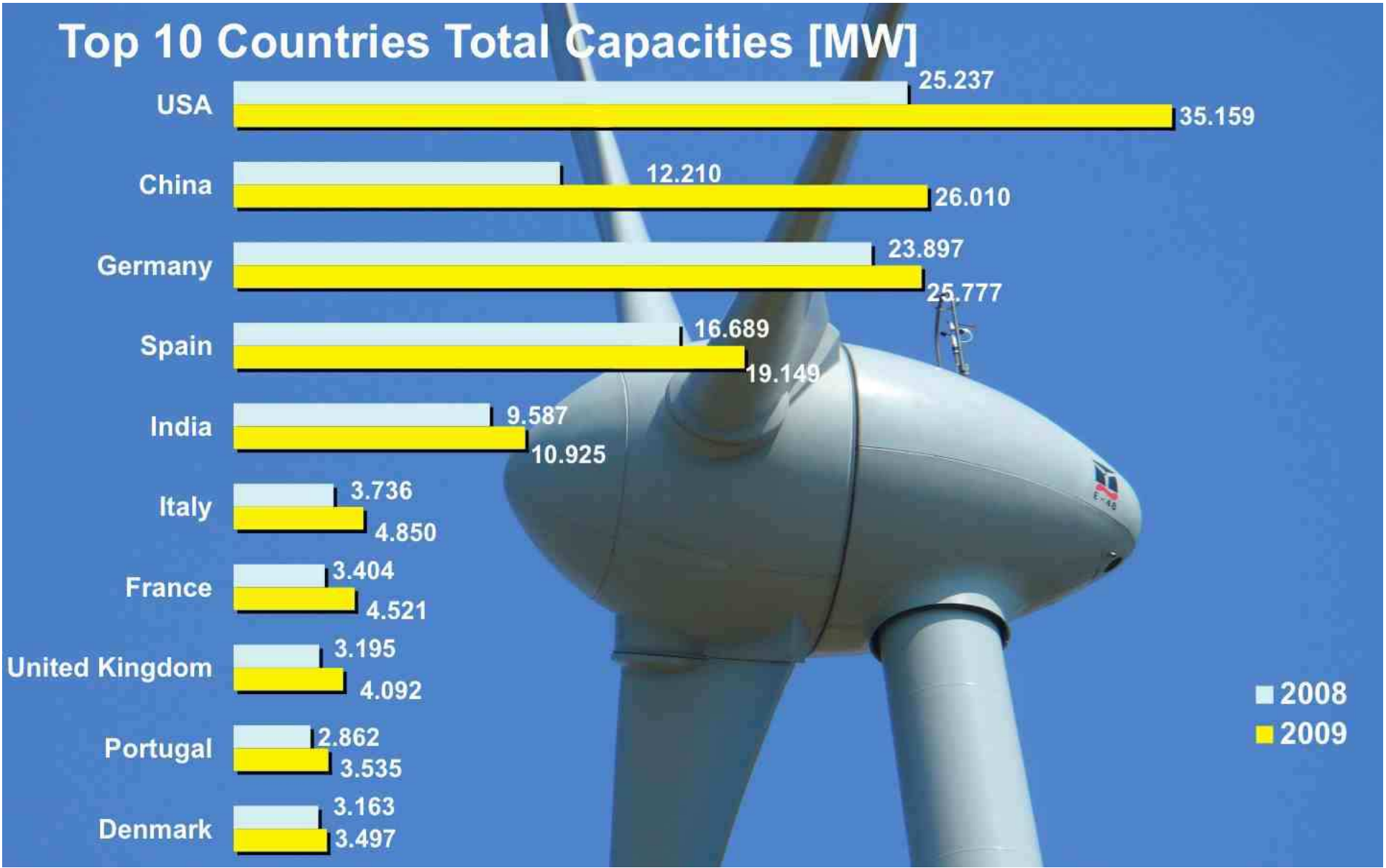
3.6. Evolution of Wind Energy Market

Source: World Wind Energy Report 2009 (10 March 2010)



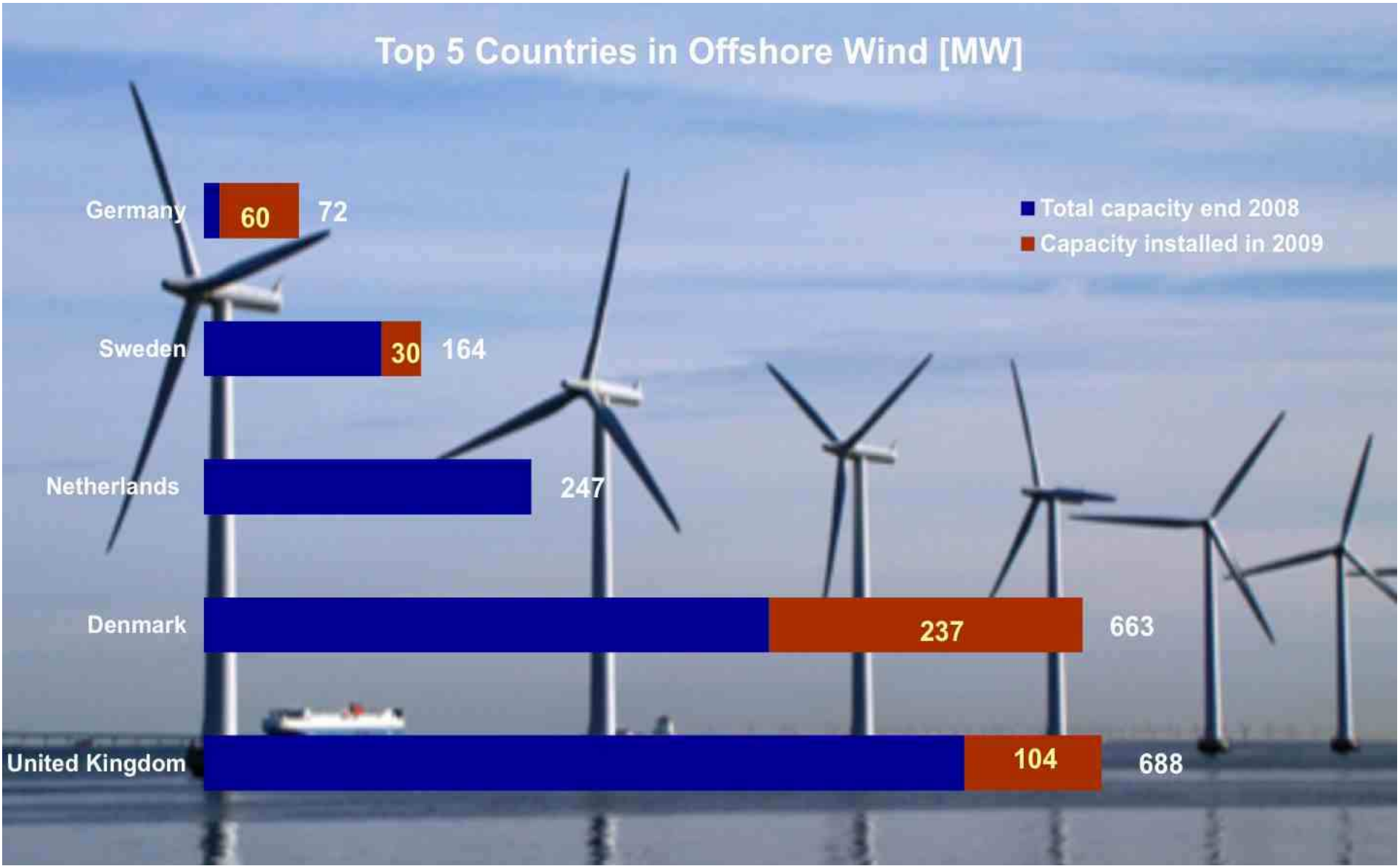
3.7. Top 10 Countries Capacities

Source: World Wind Energy Report 2009 (10 March 2010)

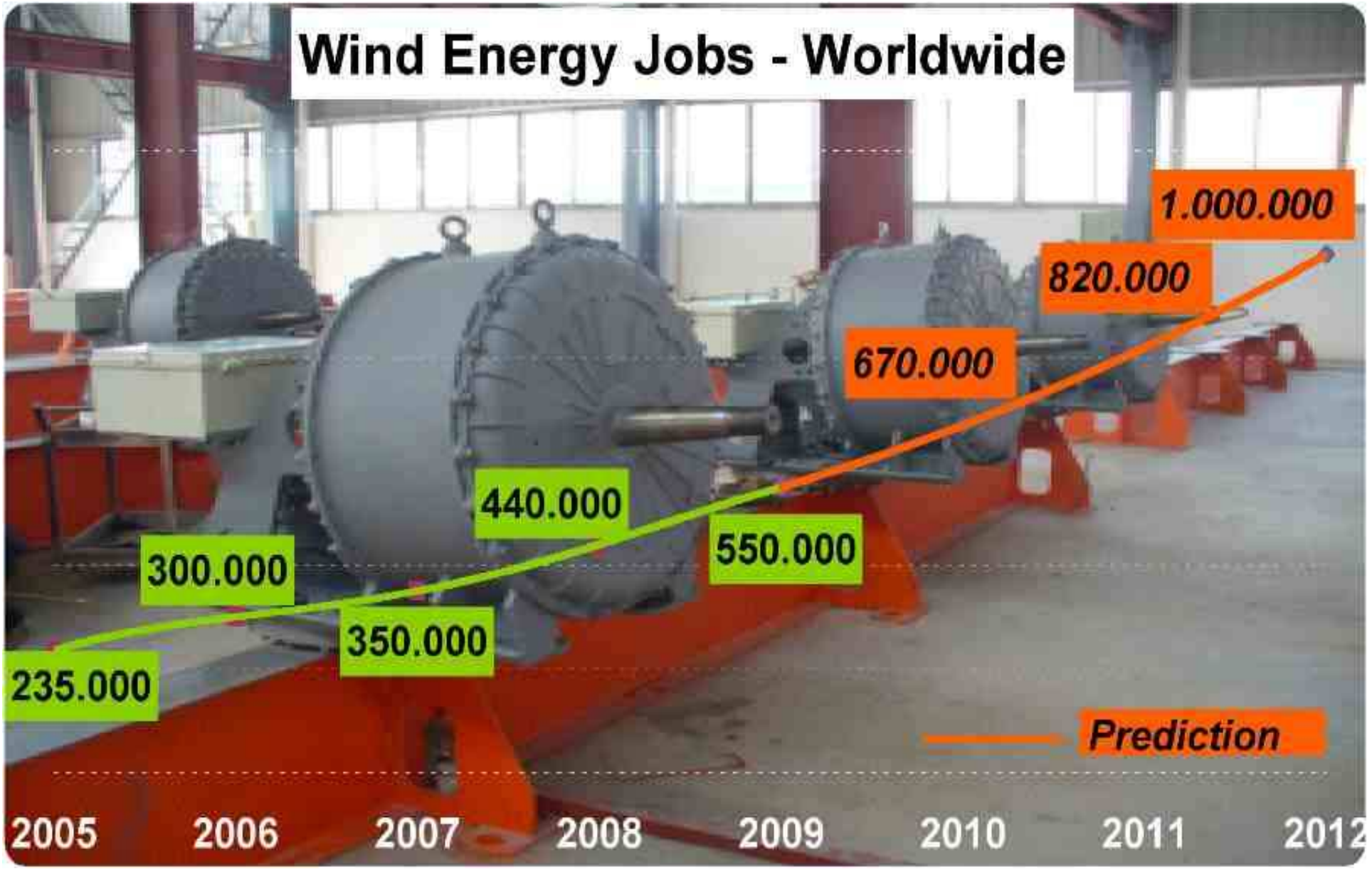


3.8. Off-shore Wind Energy Market

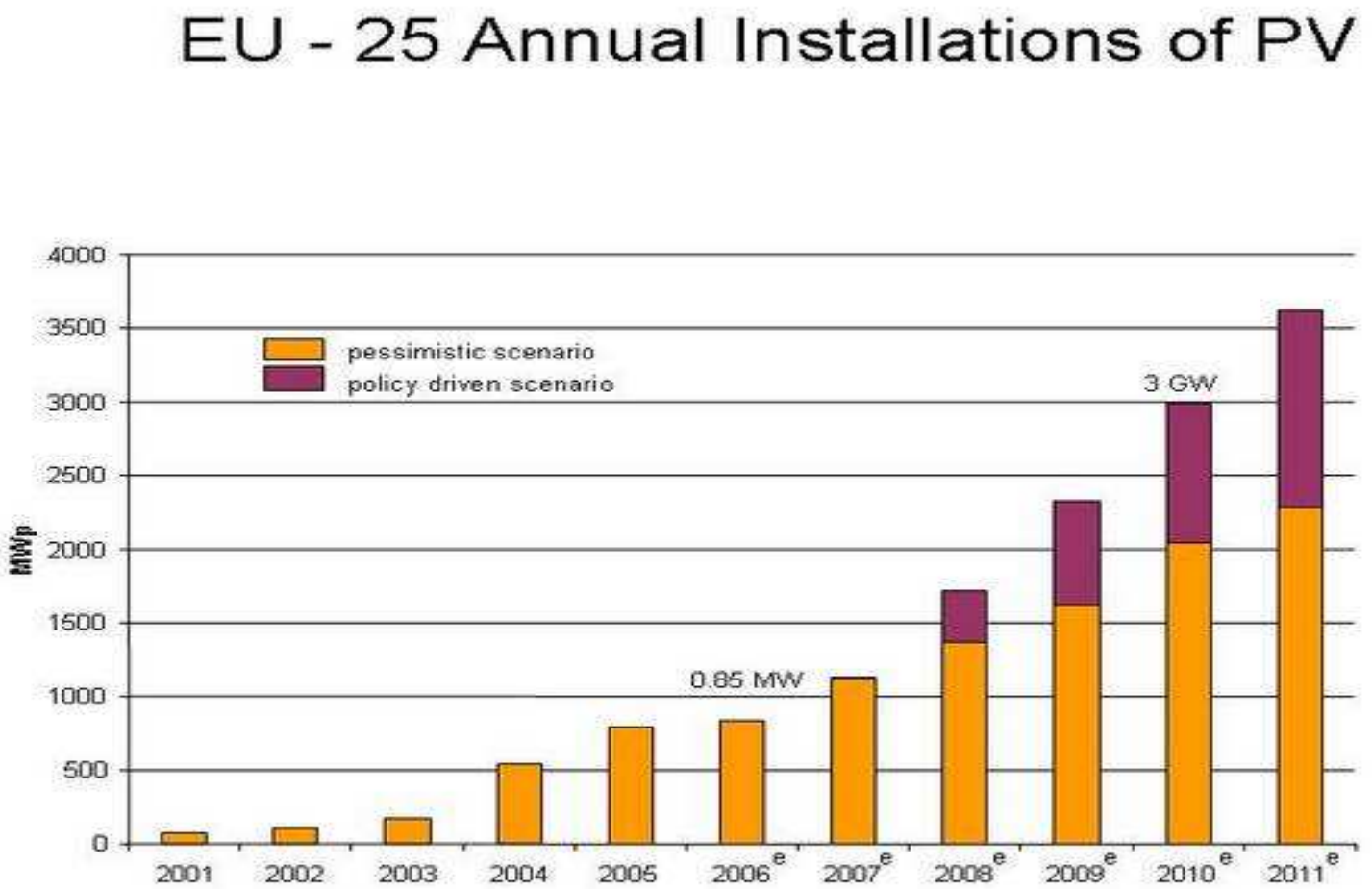
Source: World Wind Energy Report 2009 (10 March 2010)



3.9. Wind Energy Jobs Worldwide in 2009



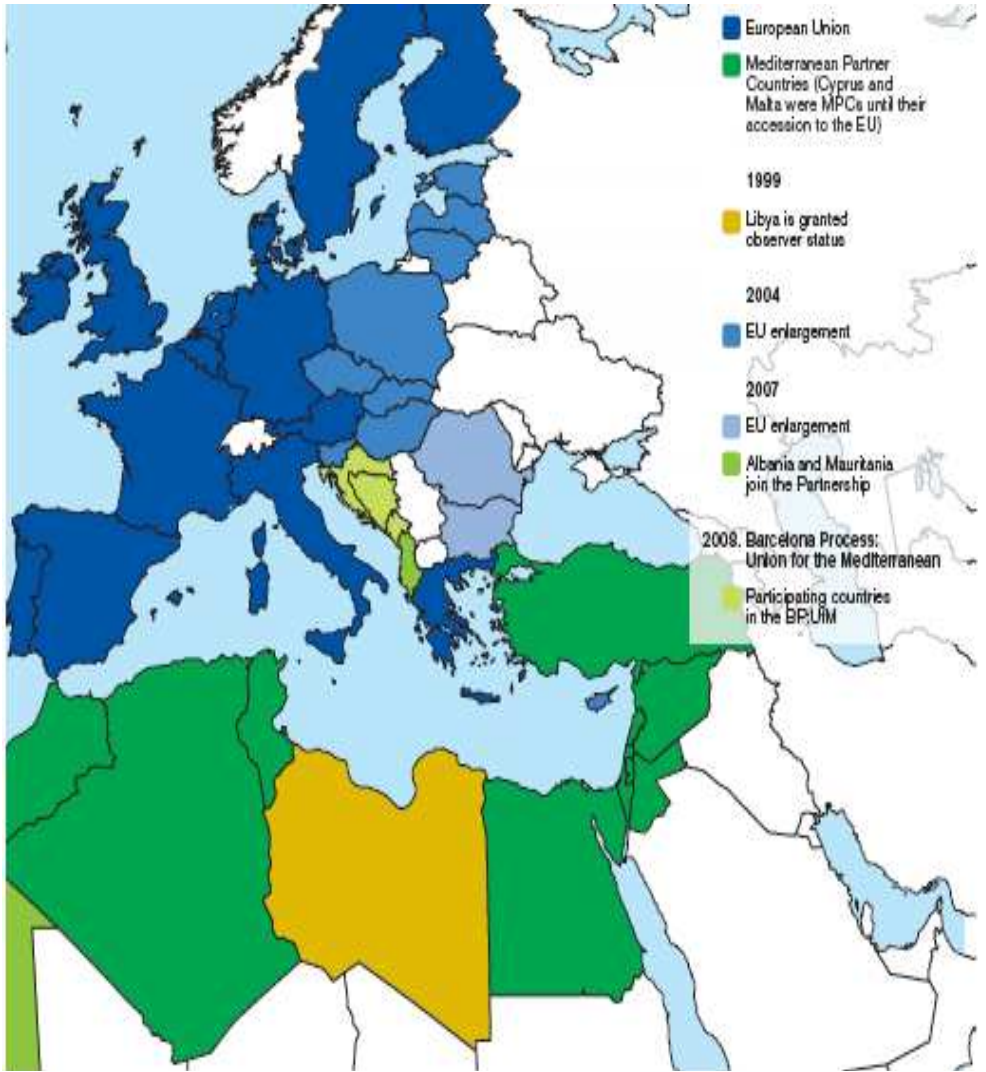
3.10. Photovoltaic Installations in EU-25



4. European Solar Plan

- **Regional Focus on Mediterranean (MENA : Middle East and North Africa)**
- **Political Context: Union for the Mediterranean** and **European Solar Plan (2008)**
- **Research Context:** Conceptual Debate (1988-)
- **Economic: DESERTEC Industrial Initiative (since 2009)**

4.1. Regional Focus on Mediterranean & MENA Region



- 1995: **Barcelona Process of Euro-Mediterranean** Partnership (Spain/Italy)
- July 2008: Sarkozy (F): UfM **Union for Mediterranean**

Six Priority Projects (2008):

1) De-pollution of the Med.;
2) Maritime and Land Highways;
3) Civil Protection;
4**) Alternative Energies & Mediterranean Solar Plan;**
5) Higher Education and Research - Euro-Mediterranean University;
6) Supporting Business

4.2.European Solar Plan

Among the goals that were considered in spring 2009 in the framework of the EU's Mediterranean Solar Plan are:

- Expansion of renewable energy systems for electricity generation (Wind, CSP, PV) and grid infrastructure for exporting „green electricity" to Europe;
- Creation of appropriate framework conditions to secure stable investments and a sustainable development;
- Development of the Master Plan Study and approval of first projects.

Two phases of development and implementation of European Solar Plan

- first phase (2009-2011) economic and technological pilot projects are programmed
- second phase (2011-2020) large scale development is planned
- [

2009: Work on *Master Plan Study* on "concrete steps for development of:

a) solar thermal power plants:
b) solar photovoltaic,
c) other renewable energy installations,
d) export of electricity to the EU along with lo-cal energy needs, e.g. for water desalination.

4.3. Developing the European Solar Plan

- **February 2010, Strategy Paper on the Mediterranean Solar Plan was examined by the MSP Expert Group two targets**:
  - developing 20 GW of new renewable energy production capacities and
  - achieving significant energy savings around the Mediterranean by 2020,
- **Goal is to develop the MSP by 2011 and implement it during planned deployment phase (2011-2020) reaching the 20 GW target by 2020**.
- **The strategy paper suggested that the MSP should develop a strategy.**
  - site selection issues, local industrial capabilities. renewable energy market
  - initiatives on solar and other renewable energies for power generation and energy efficiency;
  - progress of legislative and regulatory reforms, institutional and administrative conditions for a phased development of solar and other renewable technologies in the Southern Mediterranean countries;
  - suitable mechanisms for financing … to ensure active private sector involvement.

May 2010 conference on renewables and on European Solar Plan: Spanish EU Presidency in Valencia

4.4. Ministerial Conference (Cairo)

2-3 June 2010, Sixth Euro-Mediterranean Ministerial Conference on Energy & Renewable Energy in Cairo pointed to important role of financial institutions:

- **World Bank through the Clean Technology Fund** (CTF) approved financing of $750 million on December 2, 2009, which will mobilize an additional **$4.85 billion** from other sources, to accelerate global deployment of Concentrated Solar Power (CSP). It will do so by investing in the CSP programs of five countries in the Middle East and North Africa (Algeria, Egypt, Jordan, Morocco, and Tunisia). In addition,
- **European Investment Bank (EIB), the KfW Development Bank, and the Agence Française de Développement (AFD)** decided to jointly earmark **5 billion Euros**, for the 5 coming years dedicated to renewable energy and energetic efficiency.

5. Solar Thermal Technologies for Electricity Generation in the Deserts

Concentrating Solar Power Technologies:

- **alternatives: a) Fresnel concentrators, b) parabolic trough (400-600 ℃), c) solar tower concept with surrounding heliostat field (1200 ℃, up to 50 MW), d) solar dish (for small applications up to 50 kW).**





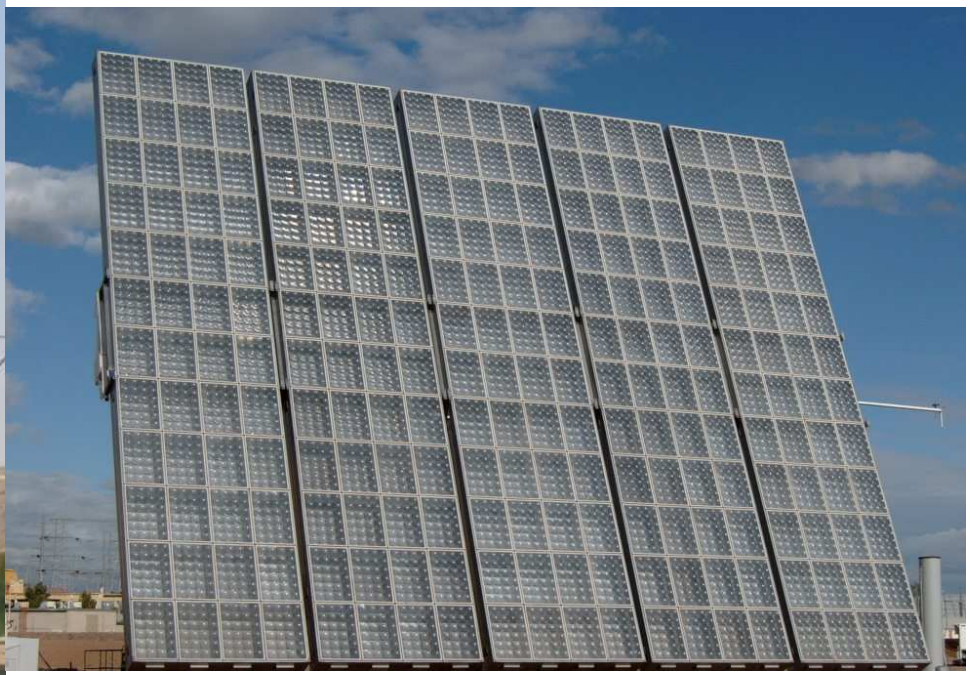



5.1. Solar Electricity Generating System - SEGS, California, USA (354 MW, since 1985)

5.2. ANDASOL 1, Guadix, Spain (50 MW, 7 h storage, 2009)

5.3. Photovoltaic Concentrator Technologies in Israel and USA

A large pre-commercial CPV system under test in Phoenix, AZ, USA, consists of 5760 plastic fresnel lenses, which each focus sunlight onto one of a similar number of individual 1 cm x 1 cm silicon CPV cells.

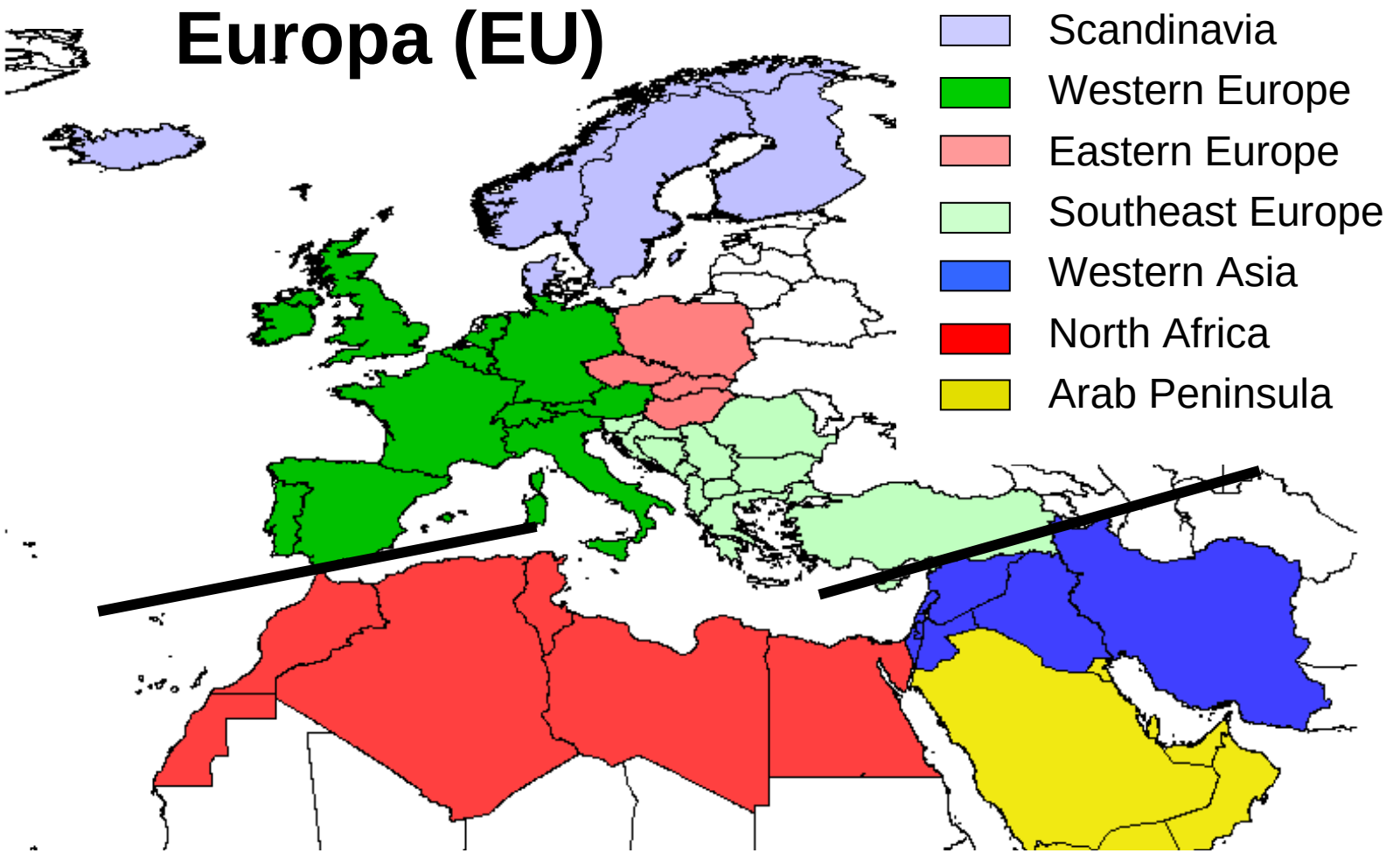


CPV cell module exposed at 1000X at the 400 m2 *PETAL* solar dish test facility in Sede Boqer, Israel. Source: left photo: H.G. Brauch (2006), right photo by David Faiman

6. Research Context: Concept Development of Energy Partnership

- 1988: Winter & Nitsch: **Hydrogen Economy** (DLR, Stuttgart):
- 1993: **Climate & Energy Partnership** between Europe & North Africa: use technological potential for renewables (solar thermal technologies) for development of the region **(employment component for the South),** help Europe meet its energy goals
- 1999: Energy Study Group of German Physical Association: Publication on long-range transmission (lead ed. Dr. Knies)
- **2002: Survival Pact**: virtual water (food) with virtual sun: interdependence of 2 key commodities (Europe & MENA)
- **2003: Knies et coll. developed DESERTEC project**
- **BMU: funded 3 projects on TREC** (DLR, Stuttgart in the lead)
- **13 July 2008**: EU Solar Plan was launched
- **July 2009:** Desertec Industrial Initiative & Desertec Foundation

6.1. TREC studied over 50 countries

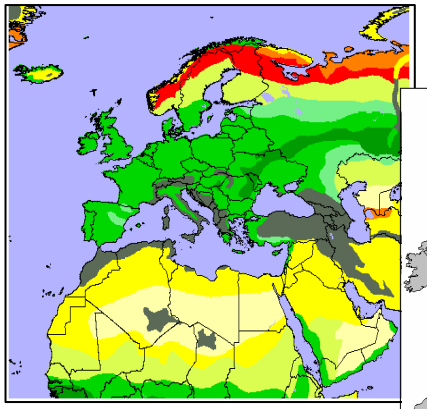


6.2. Renewable Energy Potentials in EU-MENA

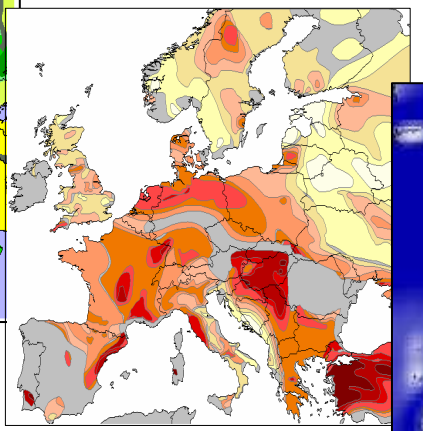
Source: Trieb, Krewitt, May, in: Brauch et al. (2009)

Biomass (0-1)

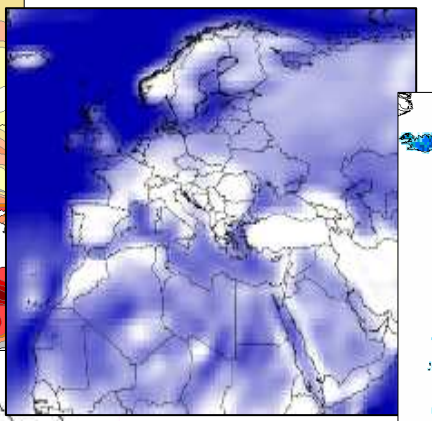
in brackets (Electricity in GWh/km²/a)



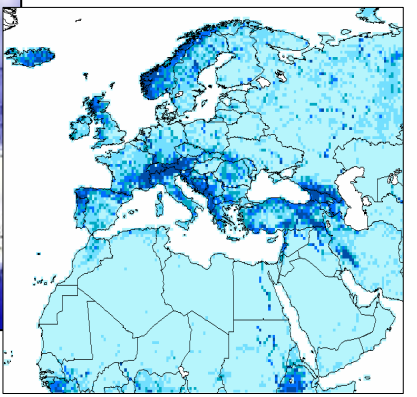
Geothermal (0-1)

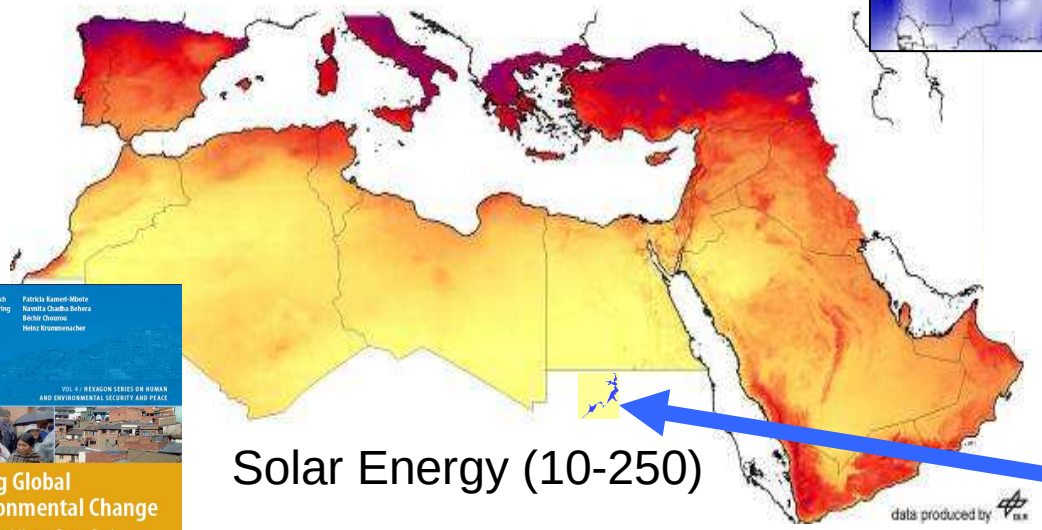


Wind Energy (5-50)



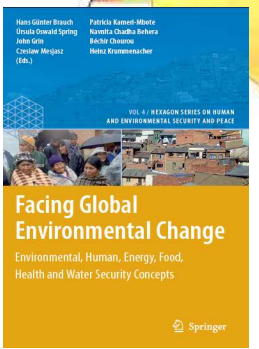
Hydropower (0-50)





Solar Energy (10-250)

A solar thermal power plant of the size of the Assuan Dam would produce 120 times as much energy, i.e. about 30% of the total European energy demand.

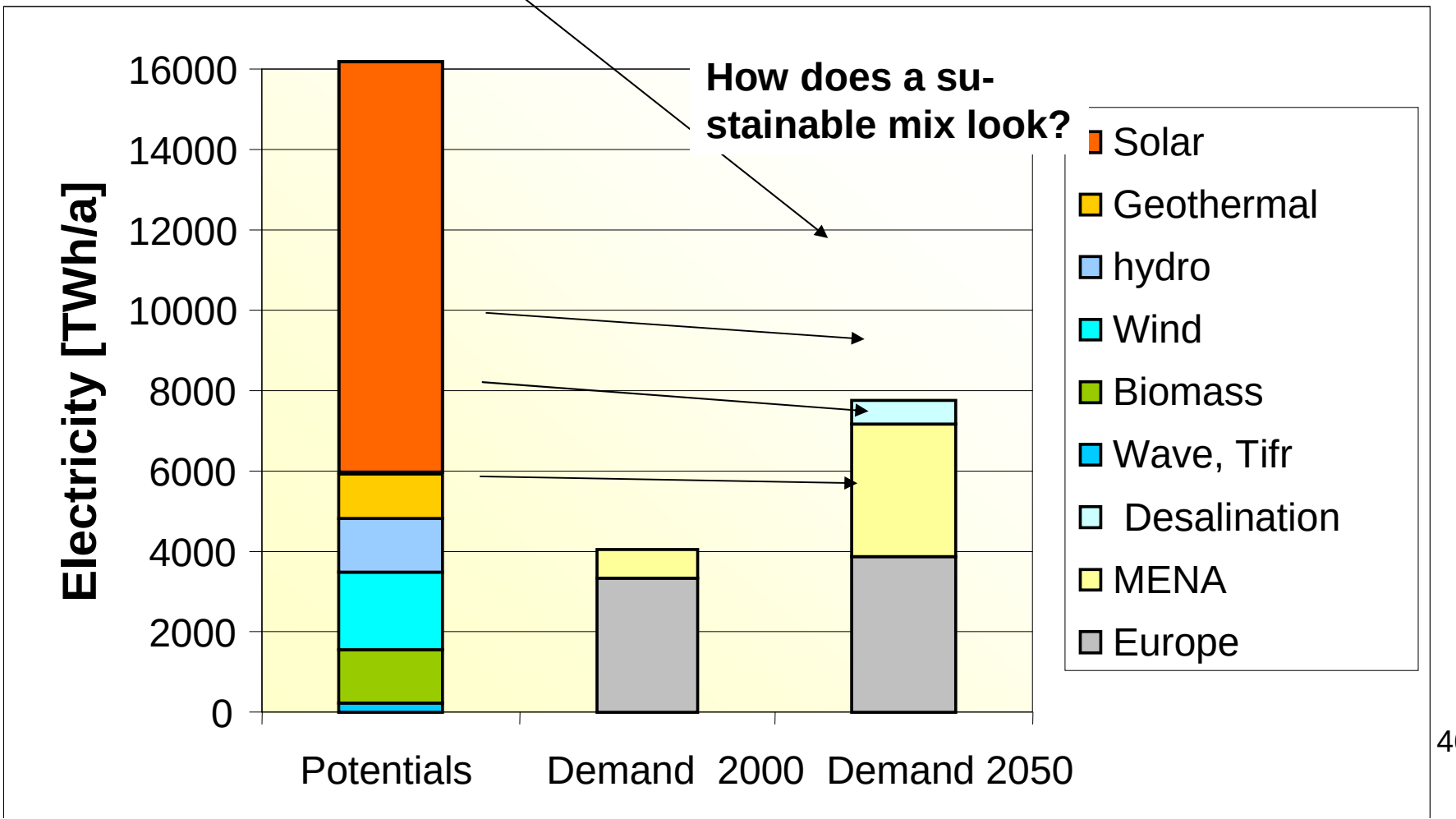


www.dlr.de/tt/med-csp

6.3. Economic Energy Potentials vs. Demand, EUMENA

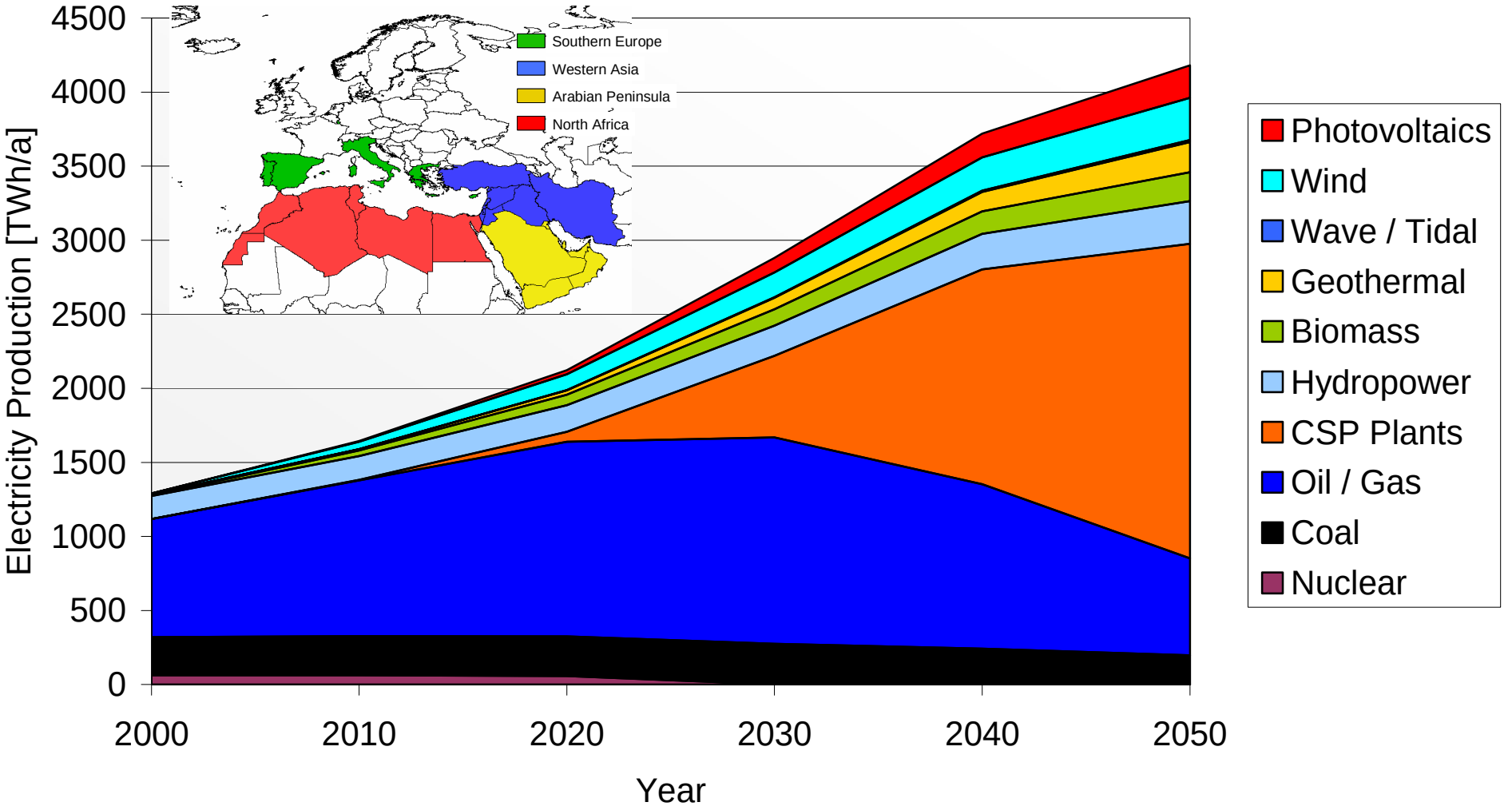
Source: Presentation Dr. Franz Trieb, 24.7.2009, Stuttgart

In German: <http://www.afes-press-books.de/pdf/Hexagon_4/Trieb_Wuestenstrom-schmal_Stuttgart_090724.pdf>

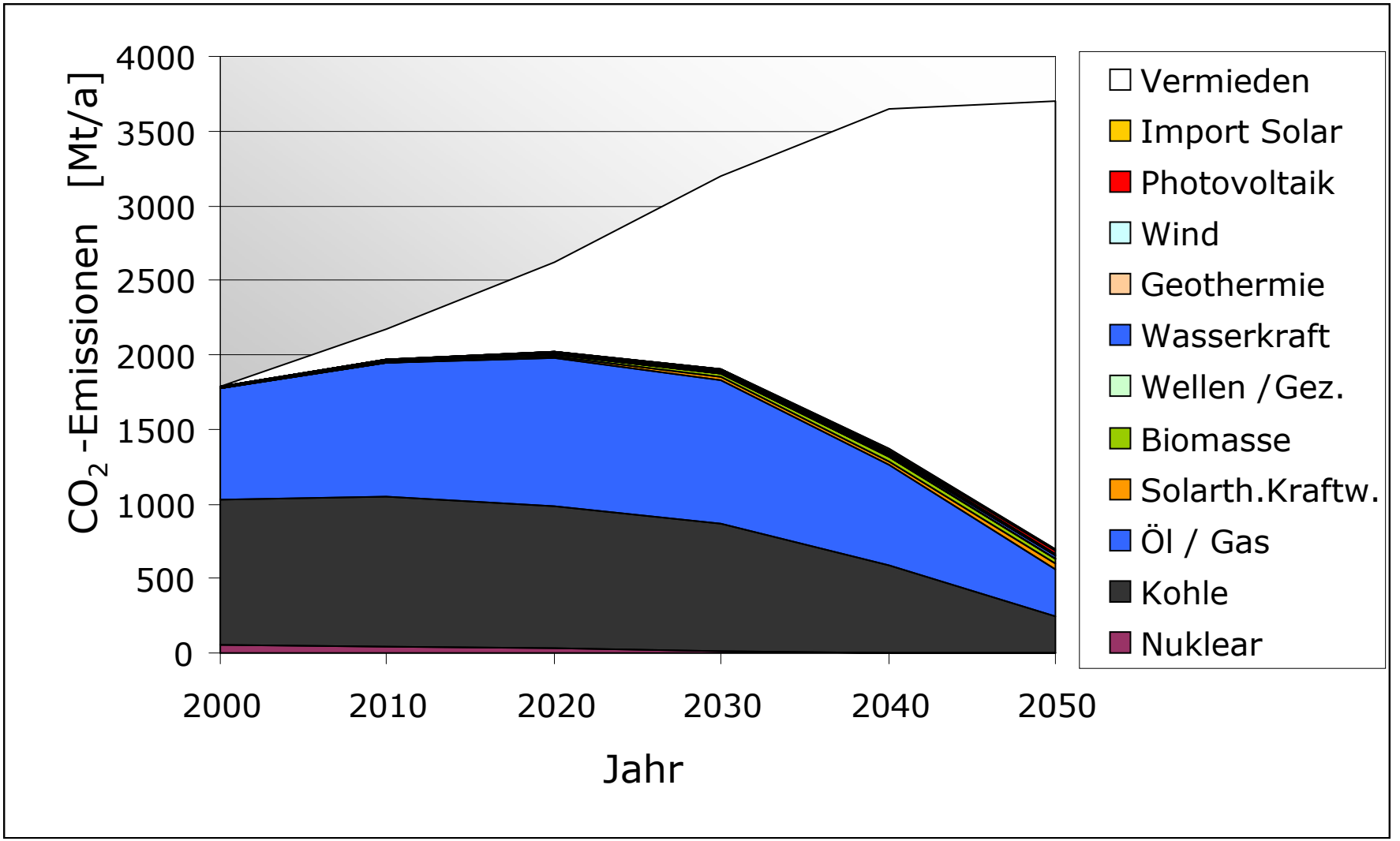


6.4. Annual electricity demand & generation within the countries analysed in the MED-CSP scenario

Source: Presentation Dr. Franz Trieb, 24.7.2009, Stuttgart In German: <http://www.afes-press-books.de/pdf/Hexagon_4/Trieb_Wuestenstrom-schmal_Stuttgart_090724.pdf>

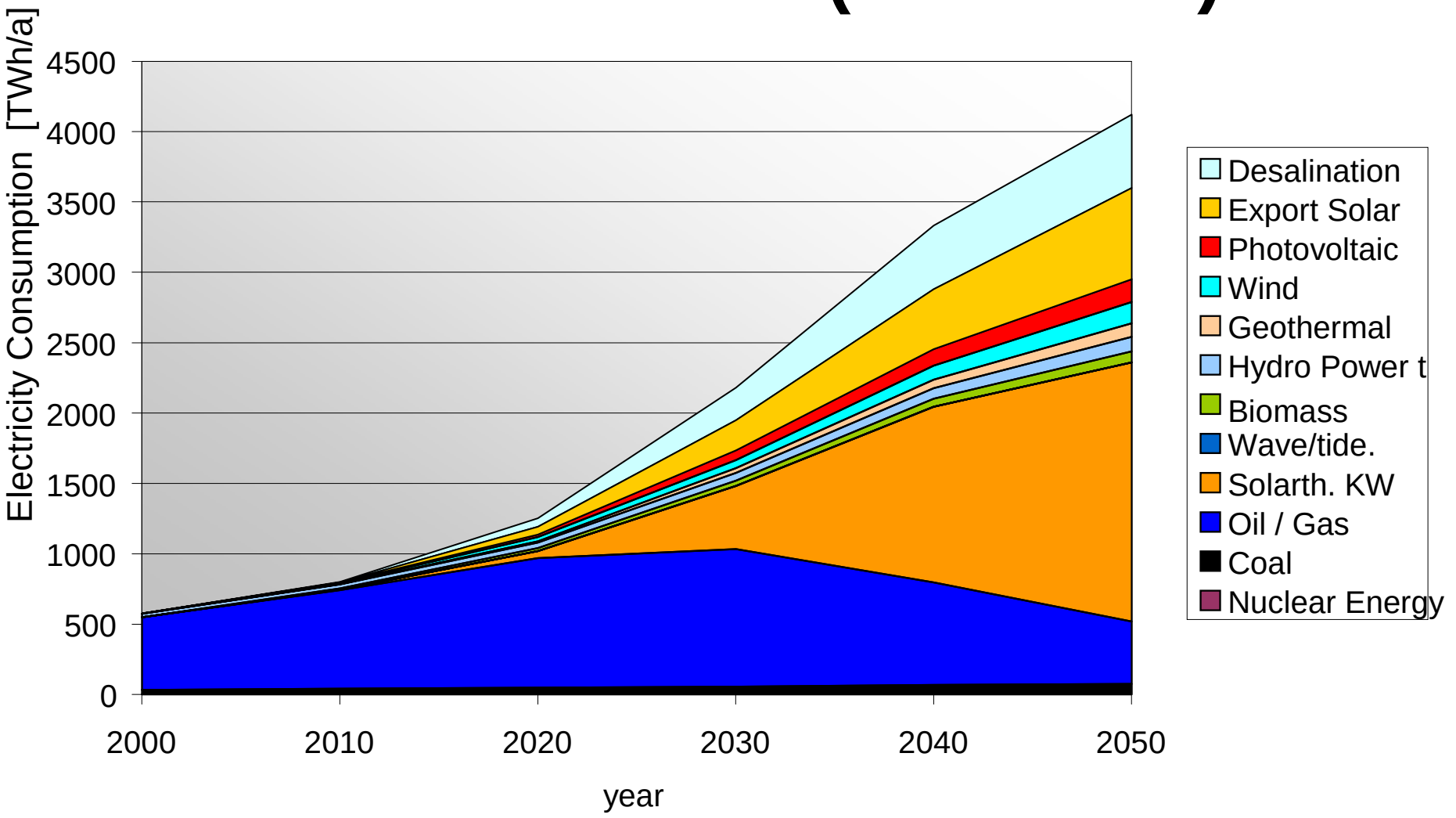


6.5. Reduction of CO_2 Emissions from Electricity Generation (0.5 t/cap/a)



Source: Presentation Dr. Franz Trieb, 24.7.2009, Stuttgart

6.6. Electricity Demand of Middle East and North Africa (MED-CSP)

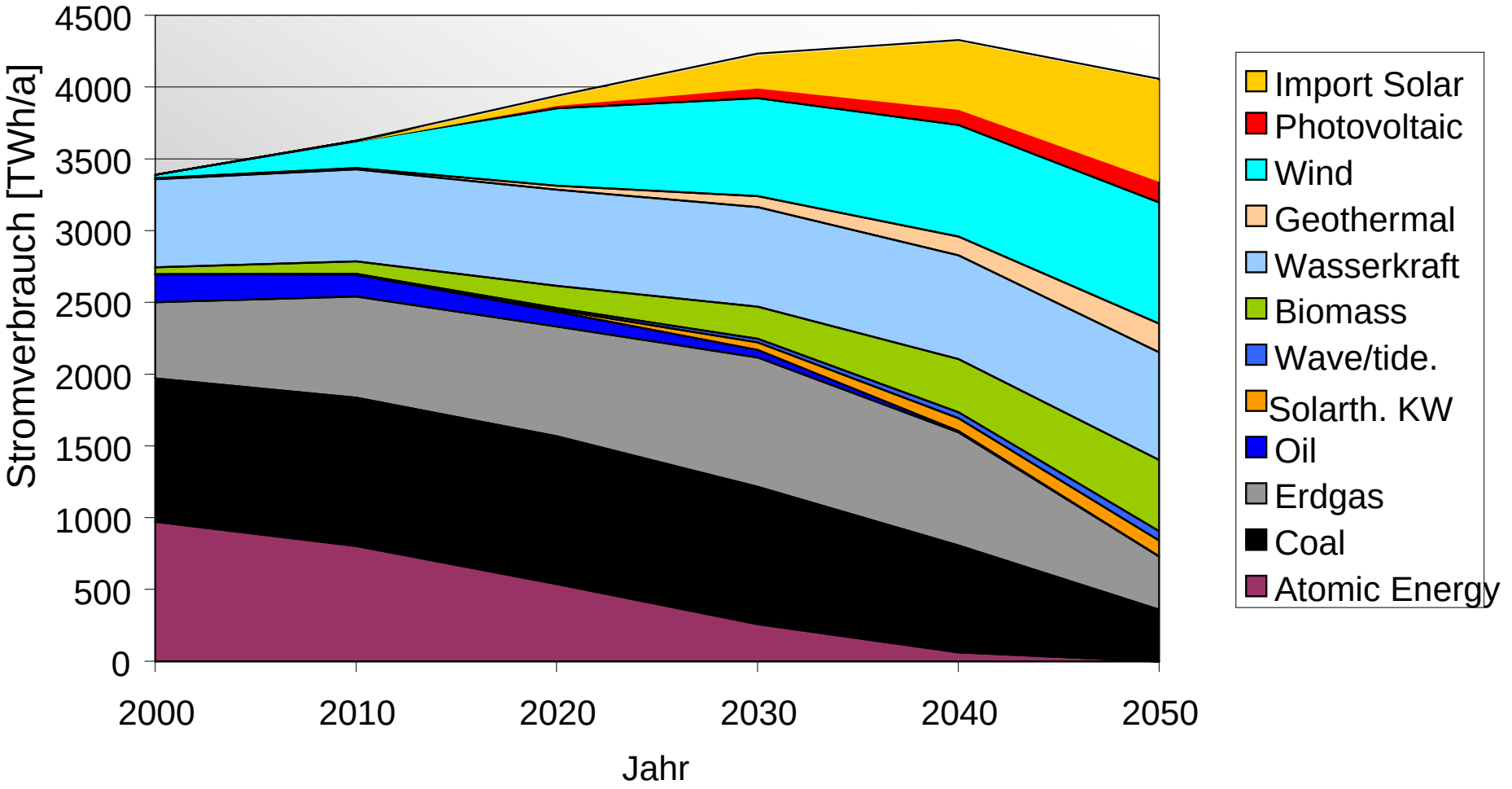


Source: Presentation Dr. Franz Trieb, 24.7.2009

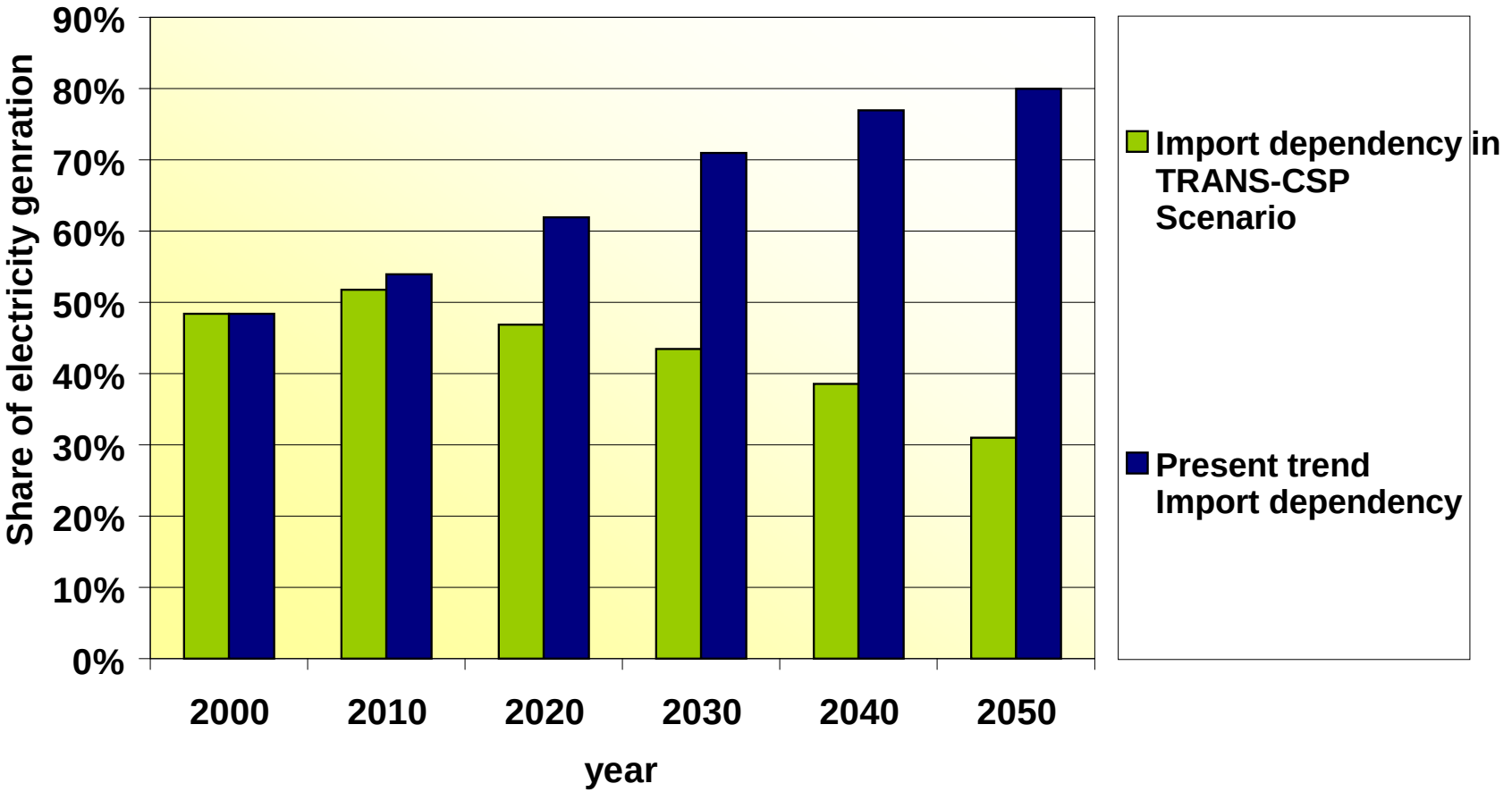
www.dlr.de/tt/med-csp

6.7. Electricity Demand of Europe (TRANS-CSP)

Source: Presentation Dr. Franz Trieb, 24.7.2009

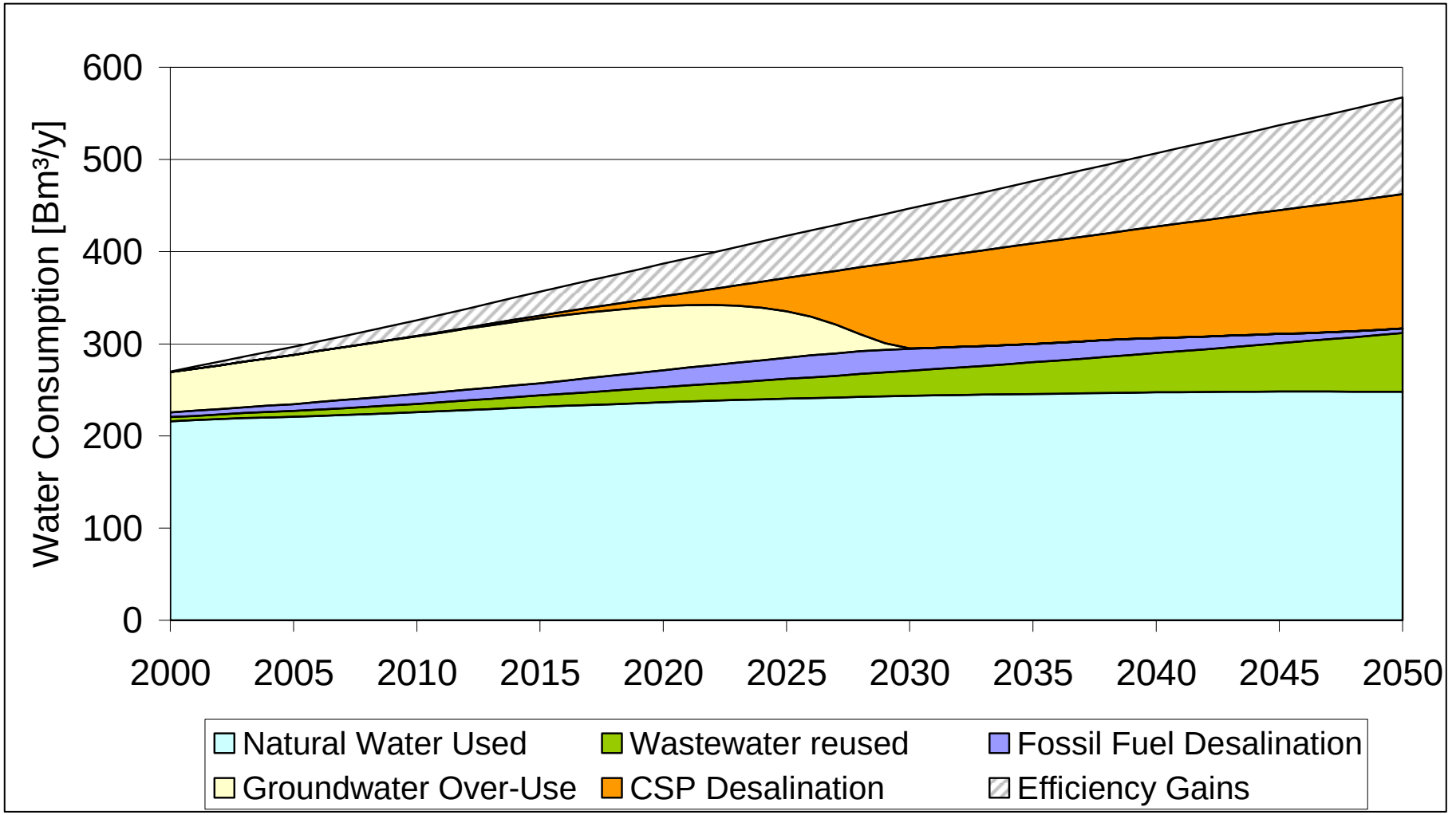


6.8. Import Dependency of Electricity Generation



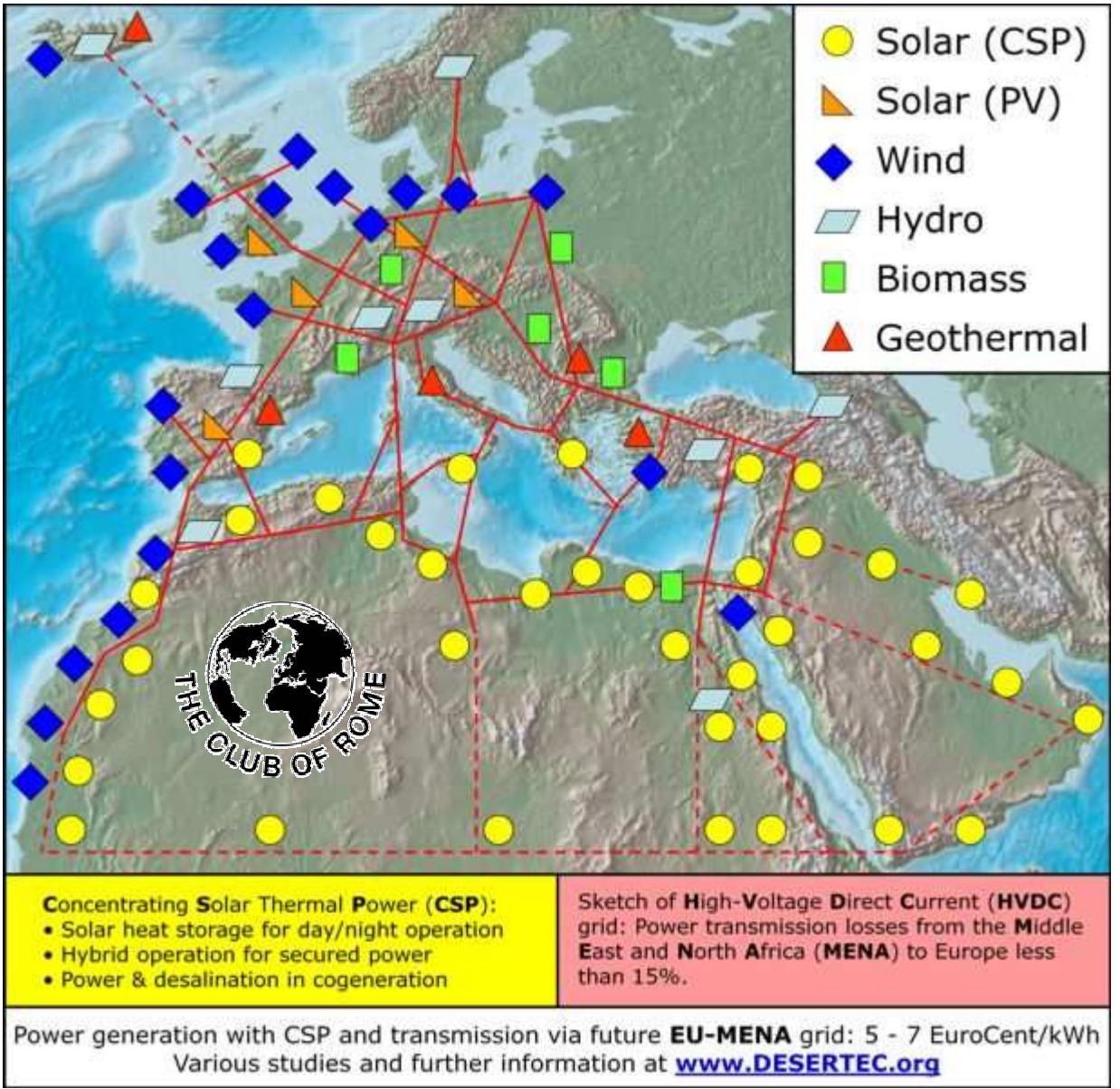
Source: Presentation Dr. Franz Trieb, 24.7.2009

6.9. AQUA-CSP Scenario for Middle East & North Africa



Source: Presentation Dr. Franz Trieb, 24.7.2009

6.10. Mediterranean Renewable Energy Potential



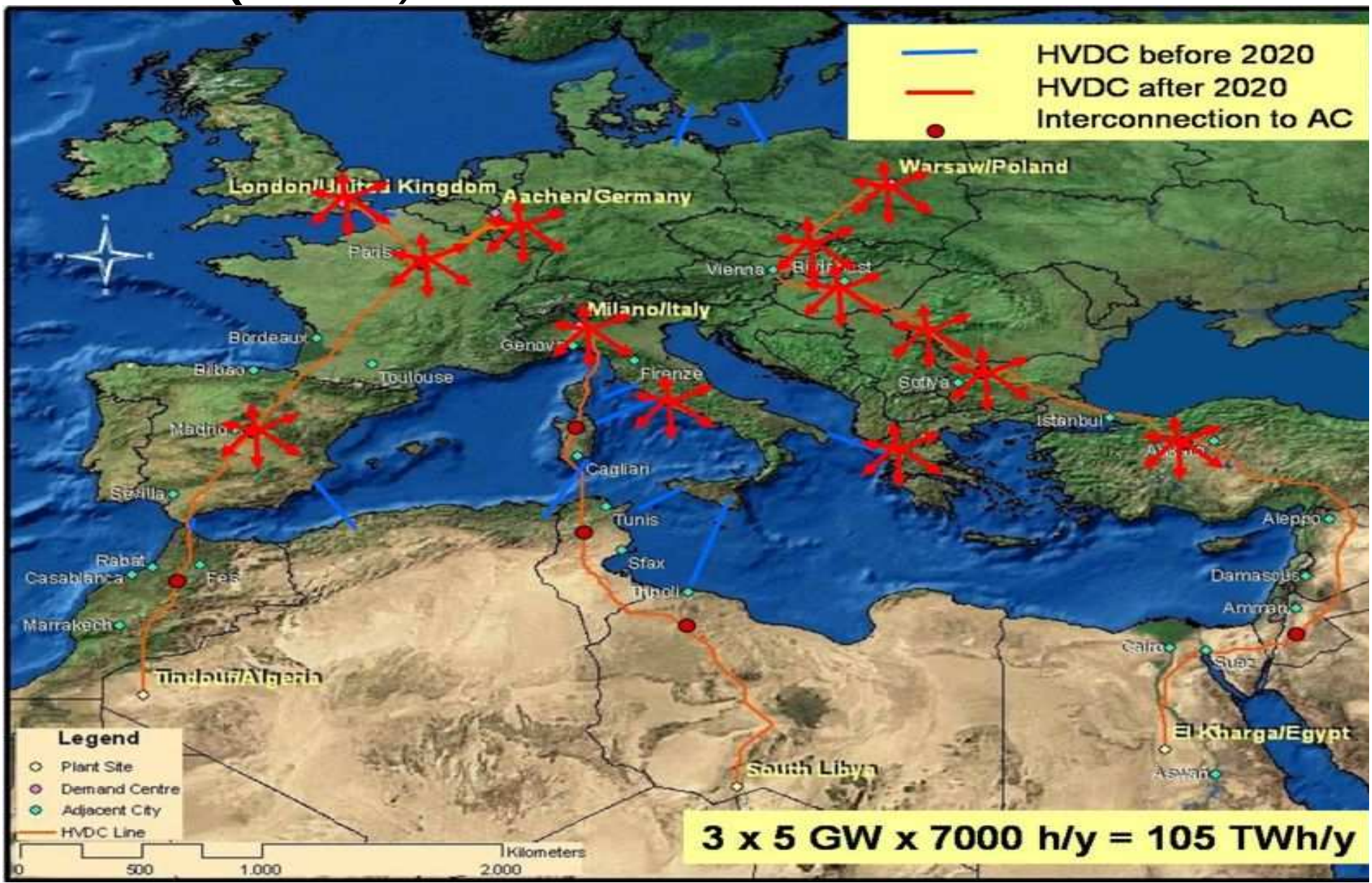
Trans-Mediterranean **R**enewable **E**nergy **C**ooperation (**TREC**) is an initiative that campaigns for the transmission of clean power from deserts to Europe.

Since 2003 TREC has developed the **DESERTEC Concept**.

6.11. DESERTEC Concept & Technology

- **DESERTEC Concept**: **less than 0.3% of desert** of MENA region, **solar thermal power plants** can generate enough electricity and desalinated seawater for current & future demands in EU-MENA.
- **High solar radiation outweighs transmission losses from MENA to Europe. Solar thermal power plants in MENA are more economic than in South Europe.**
- **Winds** in Morocco, Red Sea could generate additional elctricity.
- **Solar & wind power** can be distributed in MENA and transmitted via **H**igh **V**oltage **D**irect **C**urrent (**HVDC**) transmission lines to Europe with transmission losses of 10-15%. **Loss of power during transmission can be limited to 3% per 1000 km.**

6.12. EU-MENA: existing & planned High Voltage Direct Current (HVDC) transmission lines before & after 2020



6.13. DESERTEC Technologies

- **Solar thermal power plants (Concentrating Solar Thermal Power, CSP).**
- **Use mirrors to concentrate sunlight and create heat to drive steam turbines and electricity generators.**
- **Excess heat from additional collectors can be stored in tanks of molten salt & used to power steam turbines during the night or when there is a peak in demand.**
- **To ensure uninterrupted service during overcast periods or bad weather, the turbines can also be powered by oil, natural gas or biomass fuels.**
- **Waste heat from the power-generation process may be used (in cogeneration) to desalinate seawater and for thermal cooling**

6.14. DESERTEC Project

- **DESERTEC Concept: perspective of a sustainable supply of electricity for Europe (EU), the Middle East (ME) and North Africa (NA) up to the year 2050**.
- Cooperation between EU and MENA for market introduction of renewable energy and interconnection of electricity grids by high-voltage direct-current transmission. Sustainable energy to secure freshwater supplies based on seawater desalination.
- For a viable transition to an electricity supply that is inexpensive, sustainable and based on secure resources, rigorous criteria must be applied to ensure that the results are compatible with a comprehensive definition of sustainability.
- **The challenge of future electricity supply is to find a mix of available technologies and resources that is capable of satisfying not only the criterion of "power on demand", but all the other criteria for sustainability too.**

6.14. Implementation of DESERTEC

DESERTEC Foundation: http://www.desertec.org/

DESERTEC Industrial Initiative (founded in July 2009 <http://www.dii-eumena.com/home.html>

- **Management**
  - Dutch: **Paul van Son, Chief Executive Officer**
  - German: **Rainer Aringhoff, Chief Operating Officer**

  Shareholders: European & North African Companies
- **Activities: Dii II Annual Conference & Expo 2010 "Energy from the desert" (26-27 October 2010 in Barcelona)**

6.15. Desertec University Network founded on 3 Nov. 2010

The DESERTEC Foundation, in cooperation with the Tunisian National Advisory Council for Scientific Research and Technology, has founded a platform for scientific cooperation for DESERTEC. Founding members: non-profit DESERTEC Foundation and 18 universities and research facilities from North Africa and Middle East.

Dr. Mustapha Ayaita, Morocco, Dr. Salah Hannachi, Tunisia,
Dr. Gerhard Knies, Germany and Mr. Mouldi Miled, Tunisia.
http://www.desertec.org/en/press/press-releases/101103-01-desertec-university-network-founded-international-science-cooperation-for-clean-power-from-deserts/

It is planned to expand the network to a global platform, to promote the realization of DESERTEC Concept "Clean Power from Deserts" in different regions of the world.

DESERTEC FOUNDATION

An initiative of

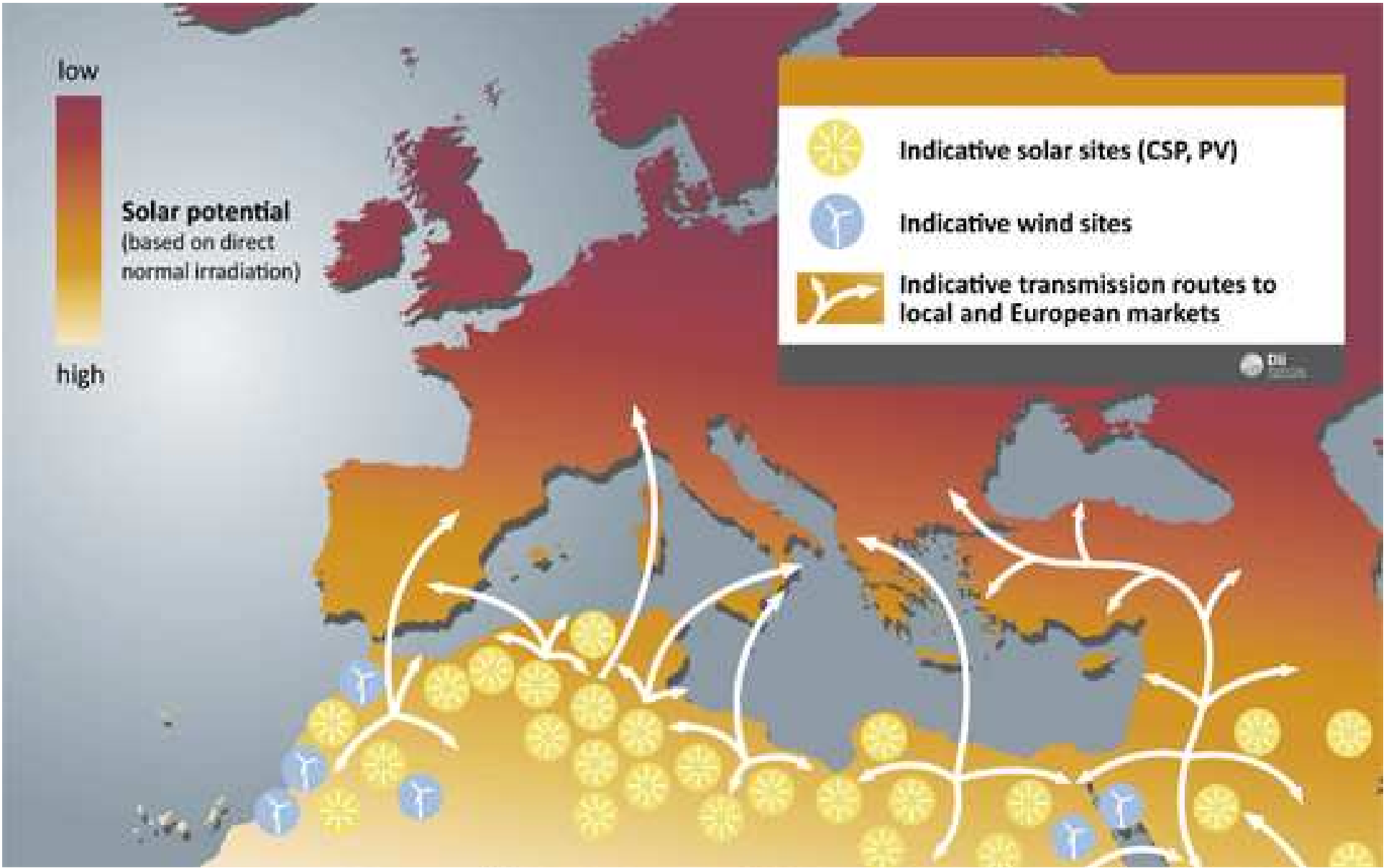
TREC Clean Power from Deserts

7. Desertec Vision: An Intercontinental Mega Project

7.1. Desertec Company Founded

- **30 October 2009:** DII GmbH (limited liability company) was set up by the group of founding members of 12 companies and DESERTEC Foundation.
- **The DII aims at accelerated implementation of the DESERTEC concept.** This work of the DII will entail a thorough analysis and the establishment of a framework for investments to supply the MENA region and Europe with power produced using solar and wind energy sources.
- **Long-term goal is: satisfy a substantial part of energy needs of MENA** countries & meet as much as 15% of Europe's electricity demand by 2050.
- **Paul van Son as CEO of DII.:** "We recognize and strongly support the DESERTEC vision as a pivotal part of the transition to a sustainable energy supply in the MENA countries and Europe.
- **Now the time has come to turn this vision into reality.**
- That implies intensive cooperation with many parties and cultures to create a sound basis for feasible investments into renewable energy technologies and interconnected grids.
- DII will primarily focus on economic, technical & regulatory conditions that must be fulfilled for successful project implementation. Early reference projects will allow us to learn for further rollout plans by DII & other parties."

7.2. DESERTEC Industrial Concept



7.3. DESERTEC Mission (2010)

Long-term goal is to satisfy both a substantial part of energy needs of the MENA countries and about 15% of Europe's electricity demand by 2050.

All shareholders agreed on common objectives:

- **analyse and develop a technical, economic, political and regulatory framework for feasible investments into renewable energy and interconnected grids;**
- **originate early reference projects to prove e feasibility of the concept;**
- **develop a long-term roll-out plan for the period up to 2050 providing investment and financing guidance;**
- **conduct in-depth studies on specific subjects, e.g. siting issues, technology developments or specific conditions in order to provide answers to key questions that will cross our path;**

All activities up to 2012 will be aimed at creating conditions for viable business and investments.

8. Implementing the Goals of the G-8 Requires a Sustainability Revolution

Need alternative strategy to implement G8 goals (reduce GHG emissions in industrialized countries by 80% by 2050).

Decarbonizatíon: fundamental change in energy economy

Key concepts of a fourth green sustainability revolution:

change in *culture*, *worldview*, *mindset* & *participative governance* in the thinking & action on sustainability for an alternative development path with a total transformation of productive and consumptive processes aiming at equity, social justice, and solidarity with the most vulnerable and marginal people and the poorest countries

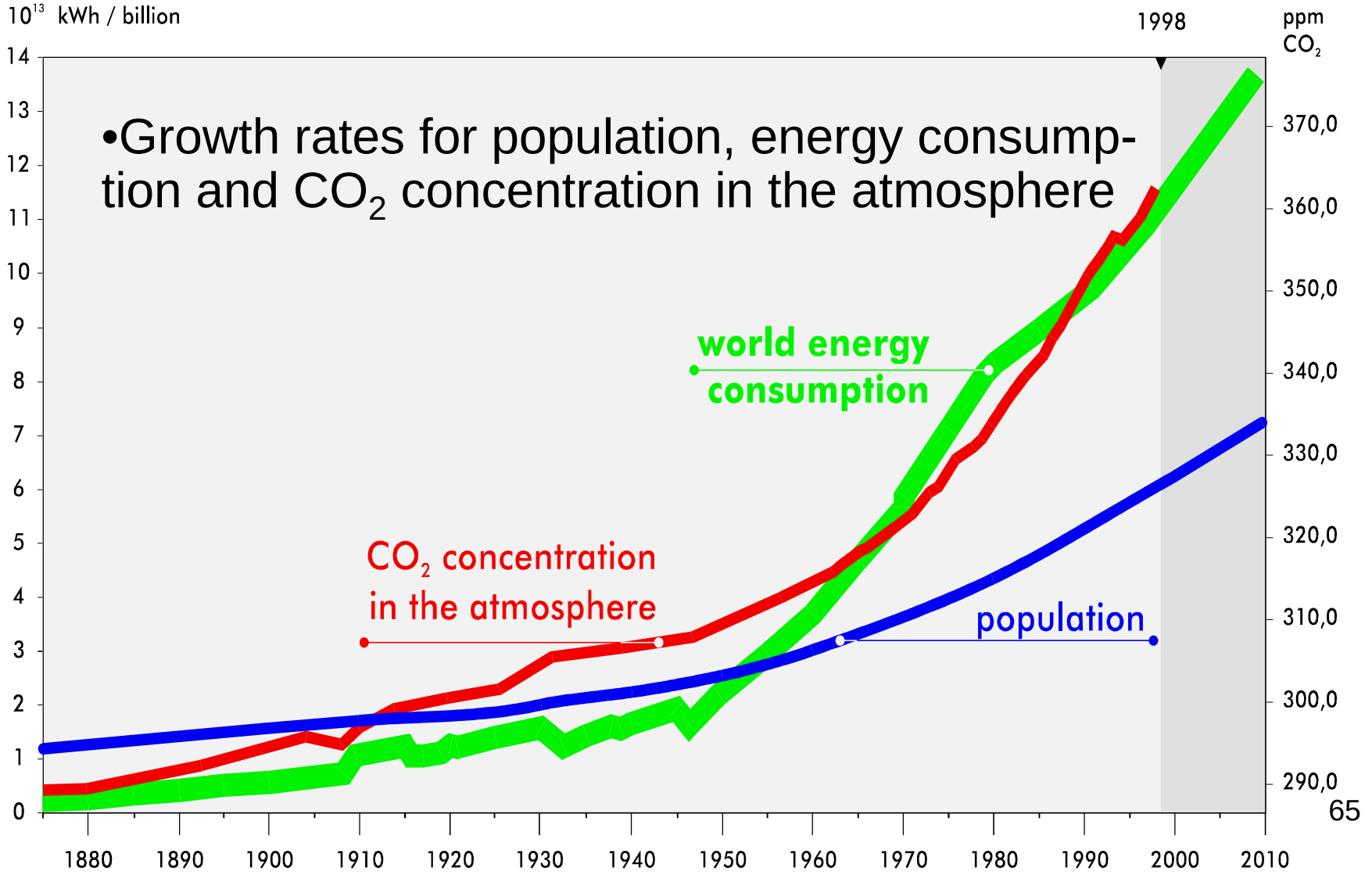
Three previous revolutions implied a cultural reorganization of productive and social system,

-- **agricultural revolution** produced stable human settlements,

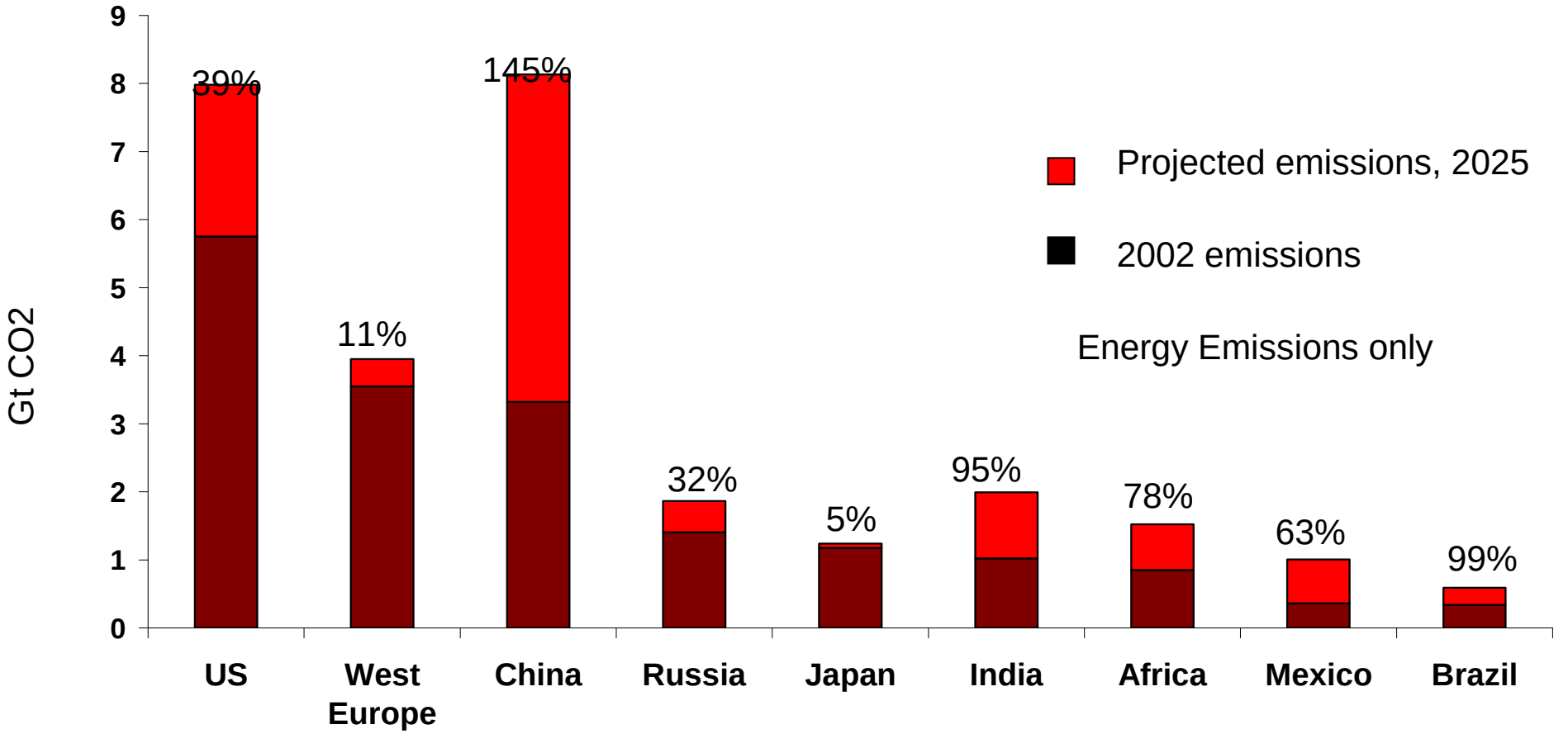
– **industrial revolution** the consolidation of urban areas, and

– **technological and communication revolution** the globalization process

8.1. Current Global Energy Situation & Future Trends (Source: J. Schmid, ISET; Kassel)

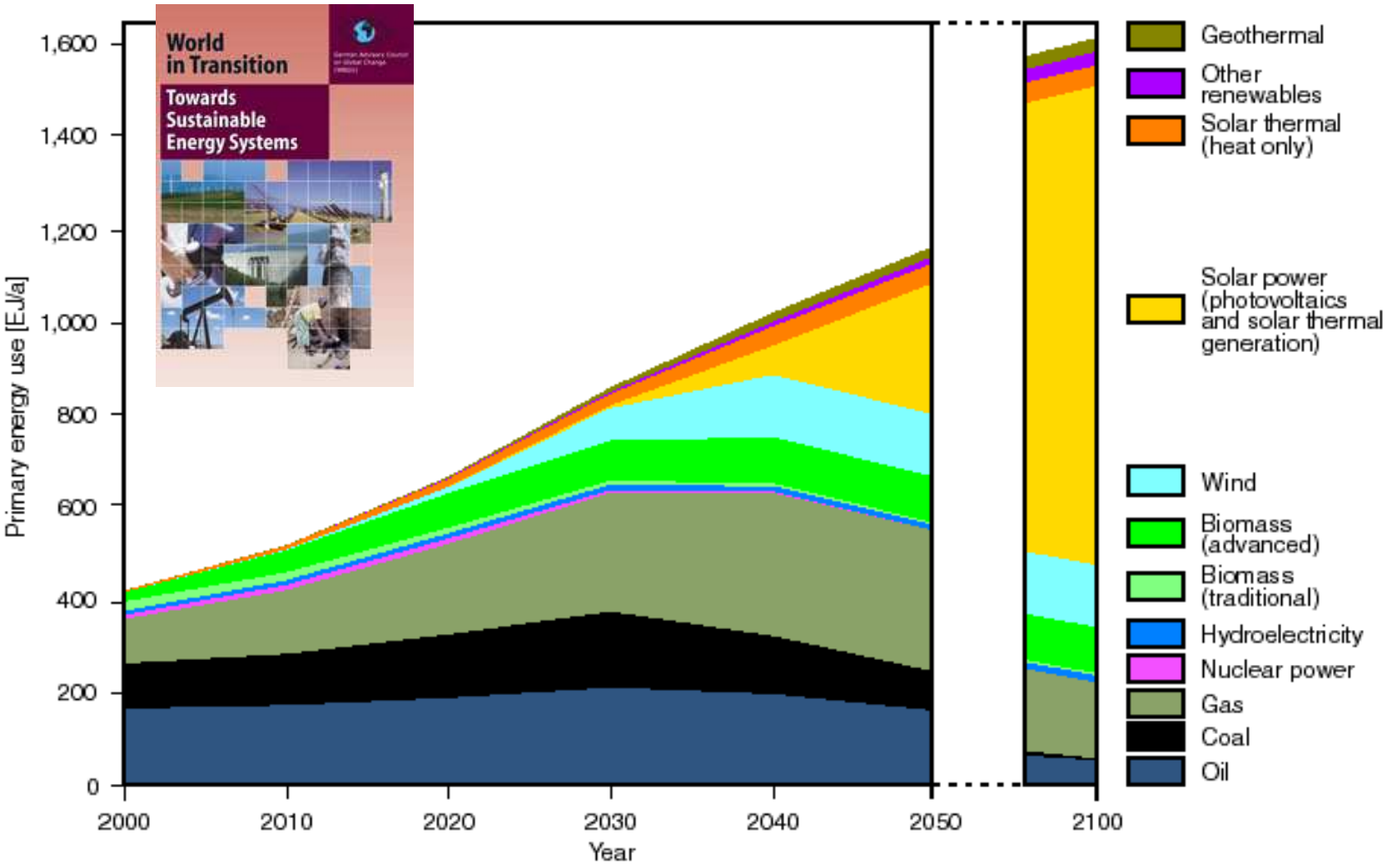


8.2. Projection: Greenhouse Gas Emissions 2025 (Energy Sector)



Source: World Resources Institute, CAIT Energy Information Administration Reference Scenario, Energy emissions only

8.3. WBGU Exemplary Path: Global Energy Mix



8.4. Implementing the G-8 Goals

Key Policy Challenge to Solve the Paradox.

- **Achievement at COP 16 in Cancun (Mexican Presidency): strengthen the UN Process**
- **Challenge of COP 17: legally binding post-Kyoto agreement**
- **EU Parliament called for unilateral 30% reduction of EU-27 GHG by 2020;**
- **Speed up: renewables & energy efficiency**
- **Form a „Coalition of the willing“: Global energy partnerships: Major Pilot Projects**

9. Conclusions: Technological Potentials and Energy Policy Vision for Mexico

- Mexico has been and will be severely affected by Global Climate Change: four National communications to UNFCC
- Mexico is leading threshold countries on global climate change: Cancun (2010), GHG goals
- Mexico has a huge physical/technical potential for renewables (use opportunity of 7th, 8th FP)
- Political and economic challenge: Exploiting renewable potential and move towards decar-bonization of the economy & creating new jobs

9.1. Research and Policy Questions

- **What are technical potentials for renewable energy sources (solar, wind, geothermal, waste, wave)?**
- **What is the technical potential for solar and wind energy in the deserts of Mexico?**
- **Is a conceptual proposal for a DESERTEC project conceivable within NAFTA as a CDM project to help the US and Canada to facilitate major reductions?**
- **Has a neutral conceptual policy proposal any potential to be considered by the parties during the Mexican Presidential Elections in 2012?**
- **Is there a potential for an** industrial **consortium?**

9.2. Policy Proposal

- Critically assess the shortcomings, potential and relevance of the DESERTEC conceptual proposal and the Desertec Industrial Initiative!
- Outline a longer-term conceptual master plan for developing Mexico‘s energy strategy further in light of Mexico‘s adopted climate change policies!
- Enter a research partnership with research institutes in the US, Canada and in Europe to develop policy relevant research schemes and on their investment needs until 2020!


Thank you
for your attention
and patience.
Text for download at:
<http://www.afes-press.de/html/download_hgb.htm
Contact: <brauch@onlinehome.de>

10. Sources

- **AFES-PRESS publications on the concept: 1994-today:**

  <http://www.afes-press.de/html/pdf/DESERTEC_publications_Eng..pdf>
- **HEXAGON Book Series published by Springer, Vol. II & IV: <http://www.afes-press-books.de/html/hexagon.htm>**
- **Brauch download page:**

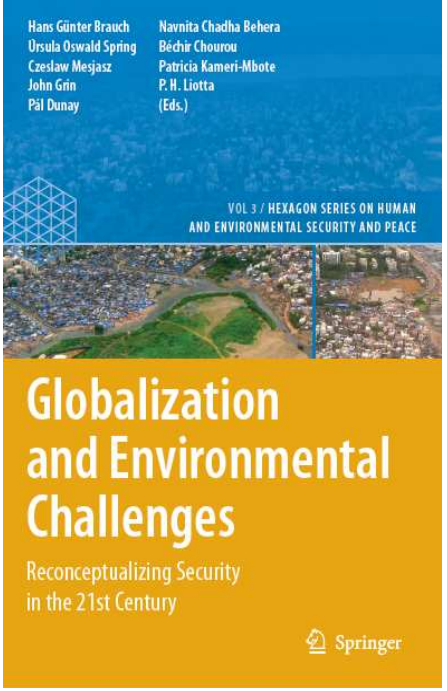
  <http://www.afes-press.de/html/download_hgb.html>
- **DESERTEC: <http://www.desertec.org/en/>**
  - **White Book:**

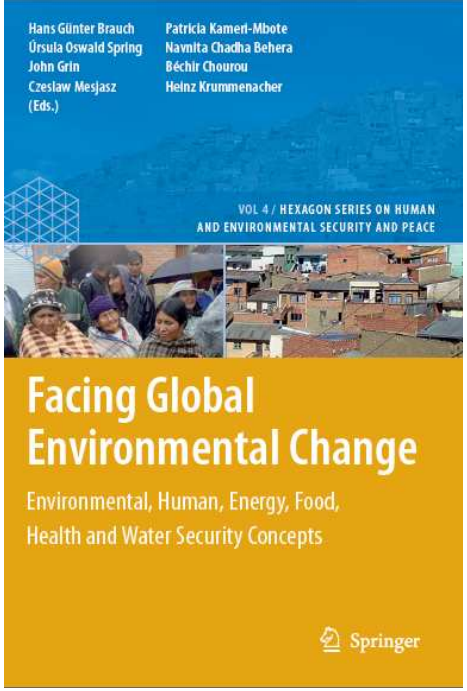
    <http://www.desertec.org/fileadmin/downloads/DESERTEC-WhiteBook_en_small.pdf>
  - **Red Paper:**

    <http://www.desertec.org/fileadmin/downloads/DESERTEC_RedPaper_2nd_en.pdf>
  - **DII: DESERTEC Industrial Initiative**

    < http://www.desertec.org/en/actions/events/desertec-industrial-initiative-assembly/>

GEHSHA

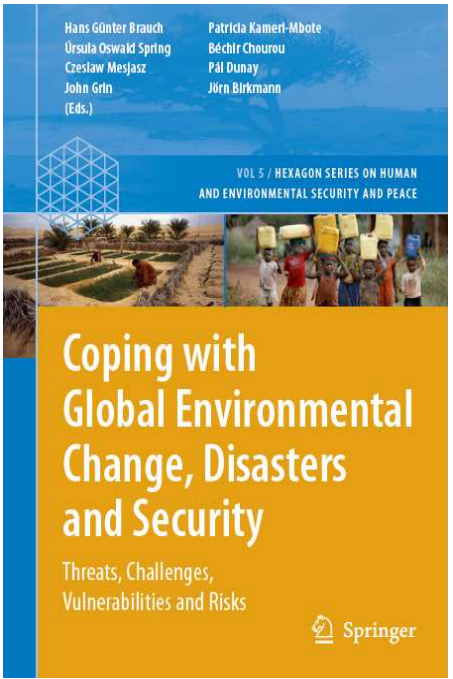




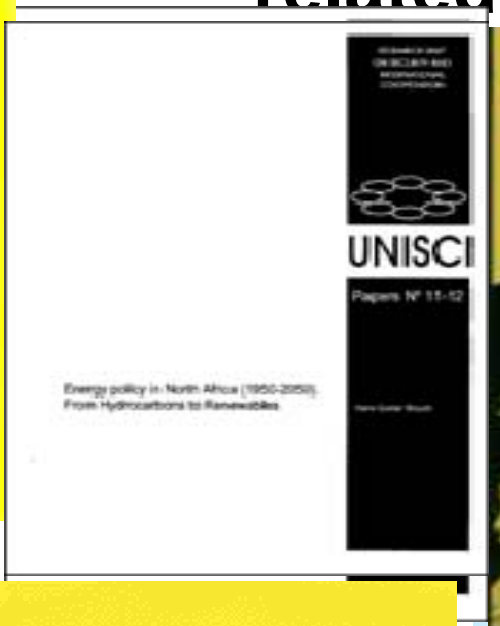
I. **Globalization and Environmental Challenges**: 92 authors, 36 countries, 16 disciplines, former vice presidents, ministers, generals, diplomats (2008)

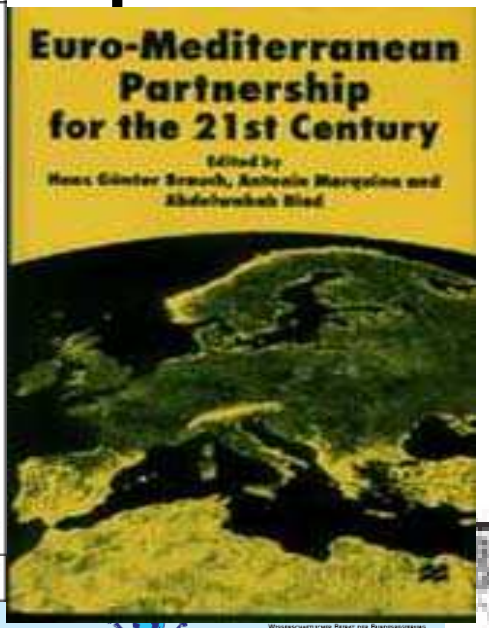
II. **Facing Global Environmental Change:** 132 authors, 49 countries on global debate and problems of environmental, human, energy, food, health, water security (2009)

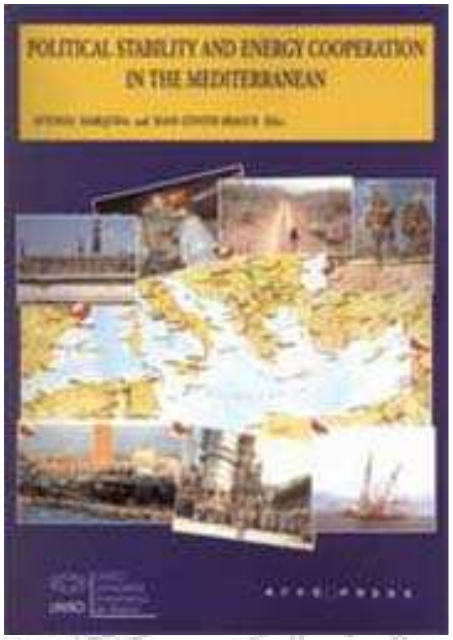
III. **Coping with Global Environmental Change** ***Disasters and Security – Threats, Challenges, Vulnerabilities and Risks*** **(2011)**

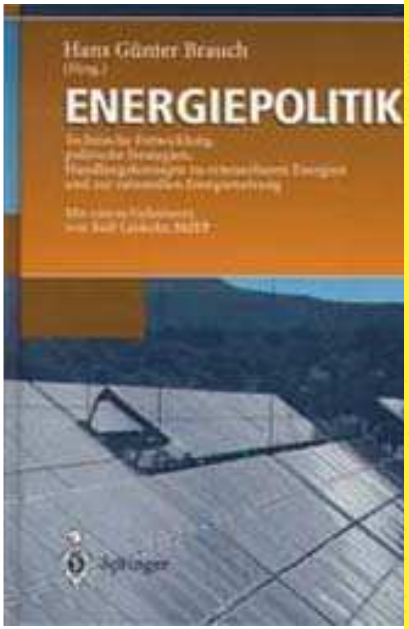


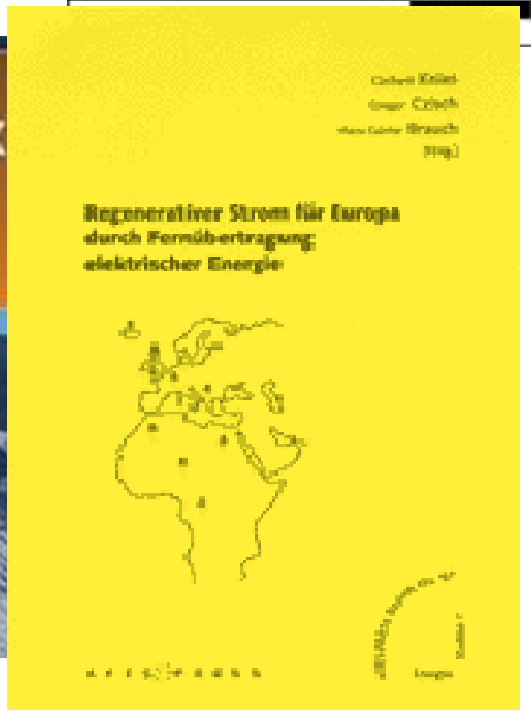
Own texts on DESERTEC related topics











Hans Günter Brauch:
Regionalexpertise – Destabilisierungs- und Konfliktpotential prognostizierter Umweltveränderungen in der Region Südeuropa und Nordafrika bis 2020/2050

Externe Expertise für das WBGU-Hauptgutachten
"Welt im Wandel: Sicherheitsrisiko Klimawandel"

Berlin 2007