Knowledge for the Desert

SOLAR ENERGY FOR SCIENCE

Towards a new energy/science partnership between Europe and MENA

HELMHOLTZ ASSOCIATION

Helmut Dosch
DESY

DESY

DESY

Hamburg

Zeuthen

Member of Helmholtz Association

Mission:

Development, construction, operation and scientific exploitation of accelerators

Provide (open) access and services for national and international users

- **Accelerators**
- **Photon Science**
- **Particle and Astroparticle Physics**

Research Collaboration with leading labs worldwide

Budget ~ 180 Mio €/a
Employees ~ 2000

Research Infrastructures: DORIS (-> 2012)**, FLASH (-II), PETRA-III, XFEL, TIER-2**

External Users: ~ 3000/year from 45 countries

Motivation

- Our mission: construction, operation and exploitation of large research infrastructures for accelerator-based research
- large research infrastructures are energy intensive
  - synchrotron radiation sources, neutron sources, X-Ray lasers, high magnetic field facilities
  - DESY 2010: 16 MW Power, 140 GWh/year, about 70 kt CO_2/year
  - future development of energy prices ?
  - how climate neutral/sustainable should research centers be?
  - =>Question of energy supply is of strategic relevance

Science is Energy-Intensive

laboratory space
(bio/chem/phys)

~300 kWh/(m²a)

University

~150 kWh/(m²a)

residential area

~40 kWh/(m²a)

Estimation for Germany:
~110 Universities, 1.5 M students
R&D spent at Universities: €11 billion

Electricity: ~3500 GWh/a
Cost: ~€3,5 billion/a

Sustainability Concept for DESY

Better Energy Management of Facilities

Existing energy consumption data only on highly aggregated level

First Step: set up an energy management / controlling system

- What are detailed electrical power / heat consumption levels at various buildings/ labs/offices?
- How do they compare to benchmarks ?
- Are there clear drivers/issues identifiable to improve efficiencies/gain savings on demand or supply side?

Strategic Research in Advanced Materials for Renewable Energies

Interdisciplinary research effort in Helmholtz association: Materials Science

Joint effort between research fields “Matter”, “Energy” and “Key Technologies”

DESY: insitu high precision analysis of materials performance on a molecular level

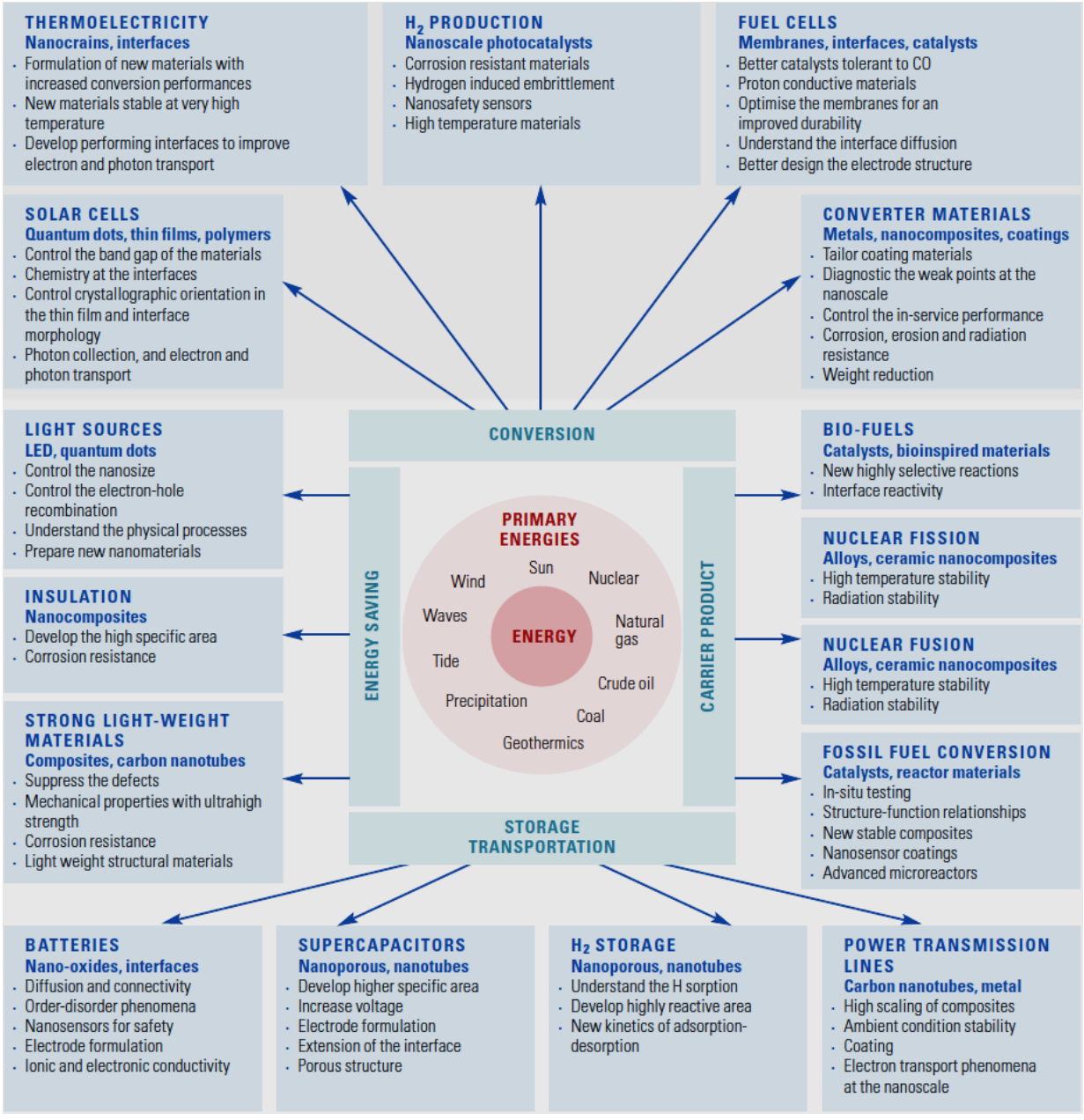
ERF issue: see GENNESYS White Book Chap. 5.6.

5.6.	Energy technology	
	5.6.1.	Overview: Nanomaterials for energy
	5.6.2.	Energy production
	5.6.3.	Energy conversion
	5.6.4.	Energy storage and transportation
	5.6.5.	Energy saving

Sustainability Concept for DESY

Recommendation for

Future Role of Europ. RIS for Energy Research



Sustainability Concept for DESY

Better Energy Management of Facilities

Existing energy consumption data only on highly aggregated level

First Step: set up an energy management / controlling system

- What are detailed electrical power / heat consumption levels at various buildings/ labs/offices?
- How do they compare to benchmarks ?
- Are there clear drivers/issues identifiable to improve efficiencies/gain savings on demand or supply side?

Strategic Research in Advanced Materials for Renewable Energies

Interdisciplinary research effort in Helmholtz association: Materials Science

Joint effort between research fields “Matter”, “Energy” and “Key Technologies”

DESY: insitu high precision analysis of materials performance on a molecular level

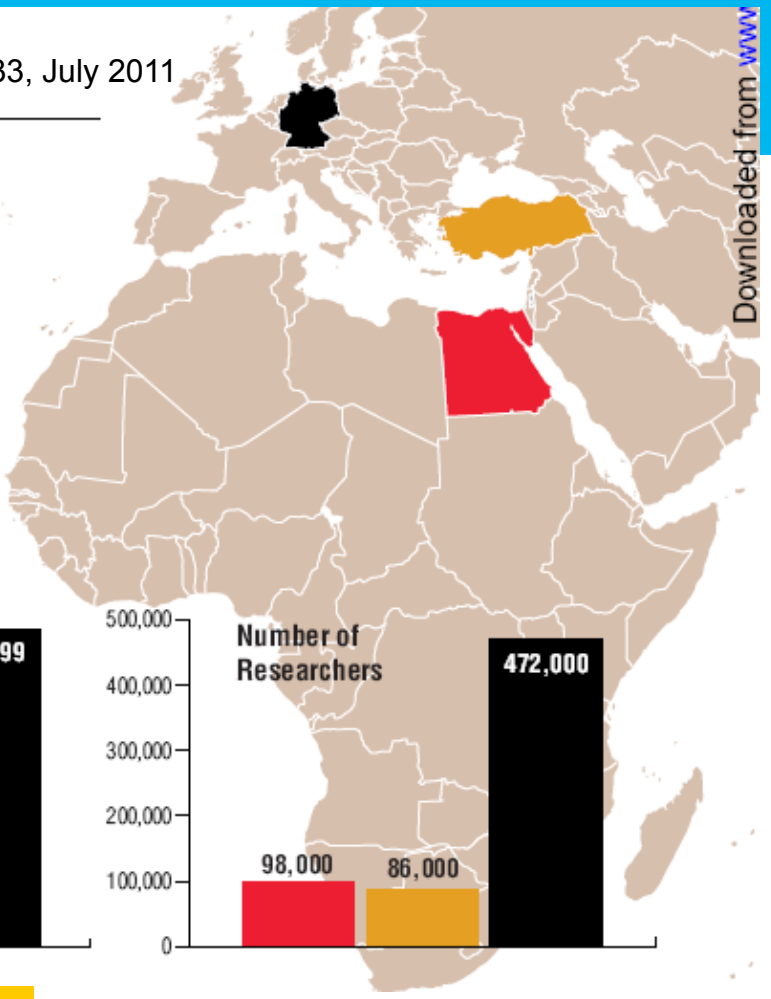
ERF issue: see GENNESYS White Book Chap. 5.6.

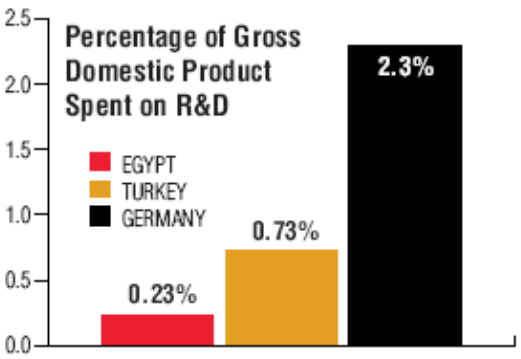
5.6.	Energy technology	
	5.6.1.	Overview: Nanomaterials for energy
	5.6.2.	Energy production
	5.6.3.	Energy conversion
	5.6.4.	Energy storage and transportation
	5.6.5.	Energy saving

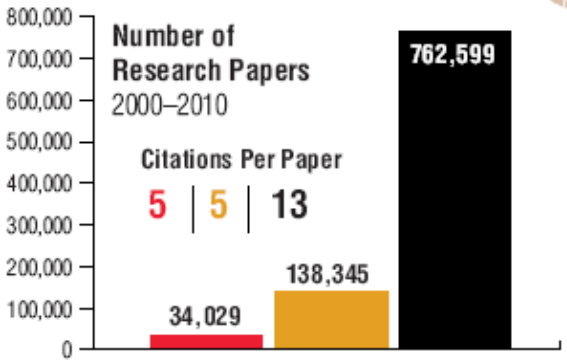
A Tale of Three Countries

Science Magazine, Vol. 333, July 2011

EGYPT	TURKEY	GERMANY
POPULATION: 83 Million	POPULATION: 76 Million	POPULATION: 82 Million
LAND AREA: 1,000,000 sq km	LAND AREA: 780,600 sq km	LAND AREA: 356,900 sq km
GROSS DOMESTIC PRODUCT: $188 Billion	GROSS DOMESTIC PRODUCT: $615 Billion	GROSS DOMESTIC PRODUCT: $3.3 Trillion



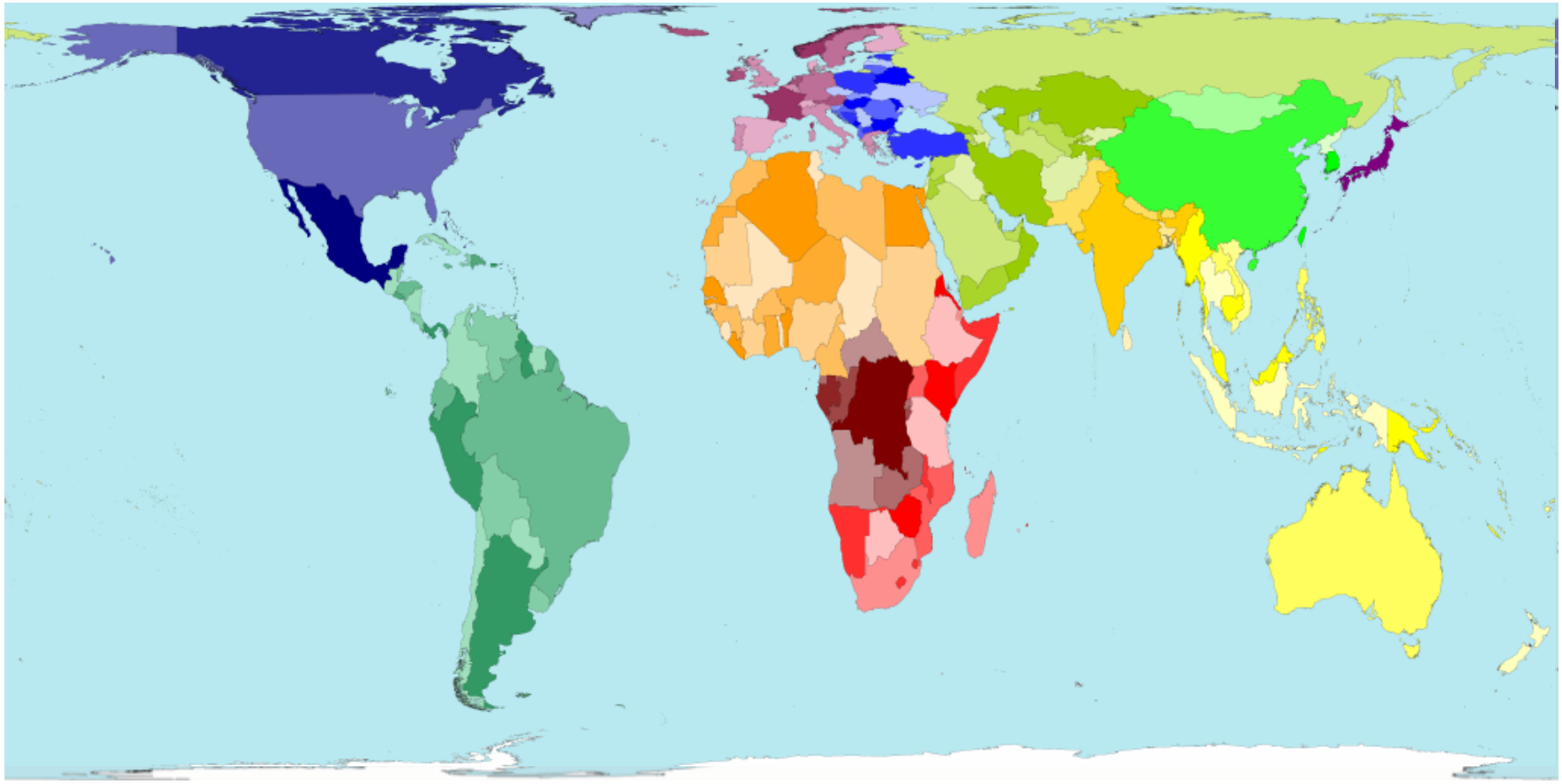




"Basic education is not sufficient to create wealth, to address concerns of food, water and energy security, to provide better health services and better infrastructure. For that, science is required." (Adnan Badran/Moneef Zou'bi)

UNESCO Science Report on Arab States 2010

The knowledge gap between North/South



~80% of all R&D spent by OECD countries
another 15% by India, China and the industrialized countries in East Asia
only 5% is left for the remaining countries.

Location of Research Infrastructures for Photon Science

SESAME

- SESAME – “Synchrotron-Light for Experimental Science and Applications in the Middle East” in Jordan
- developed under UNESCO auspices and modeled after CERN governance – uniting scientists from the region
- state-of-the-art third generation synchrotron source - to be operational in ~2014
- BESSY I – as donation from Germany - serves as 800 MeV Booster
- first three planned beamlines
  - protein crystallography
  - X-Ray absorption Fine Structure / Flourescence Spectroscopy
  - IR Beamline

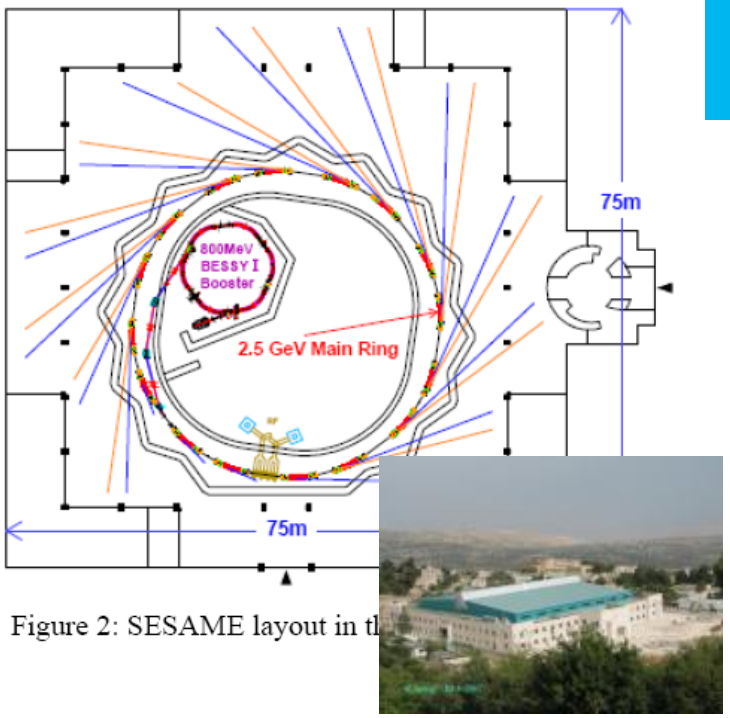


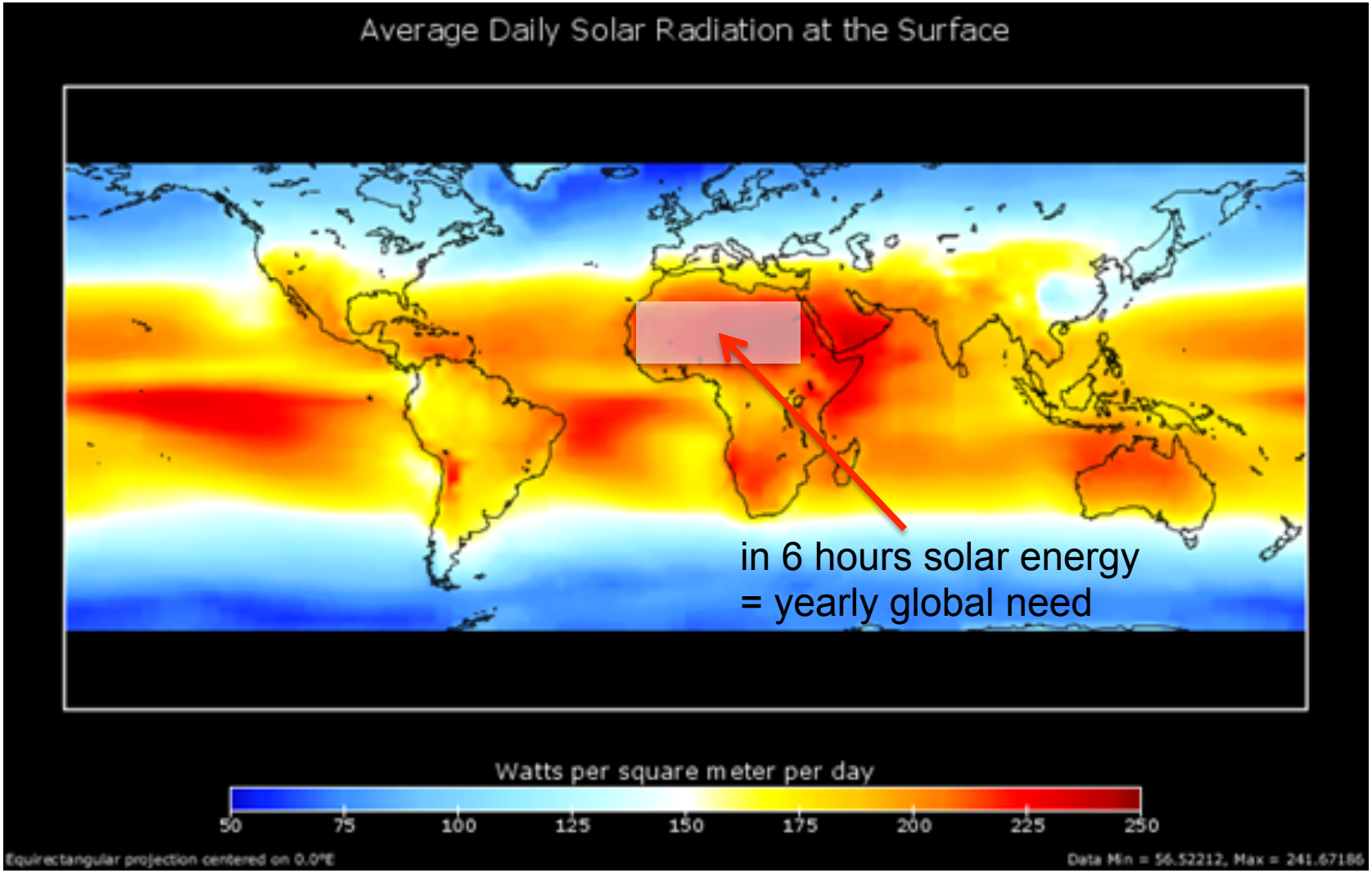
Figure 2: SESAME layout in t

RI as a centre of excellence
- strengthens fundamental research
- capacity building
- seed various research communities
- training/education young scientists
- fosters collaboration in MENA and w/ EU

“a quintessential science for peace project” (UNESCO)

Europe should better support it

The Solar Potential in the South



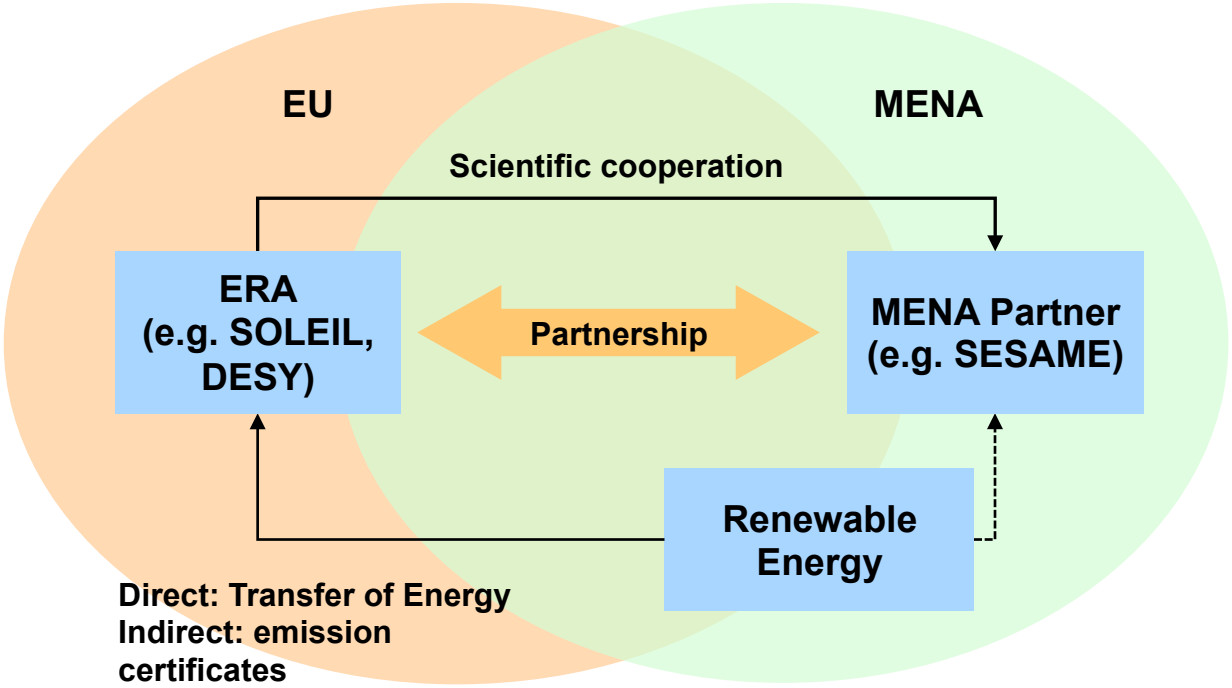
It is like a rain of 160-300 liter oil per m2 per year

Energizing the MENA Deserts

- Potential win-win situation – however, it requires
  - favorable political regulations and conditions (in export-/import countries)
  - upgrade of power grid infrastructure
  - **“Capacity building” in MENA**
  - **more knowledge/science/technology transfer from North to South and jointly coordinated research agendas**

- Proposal: Europe-MENA energy/science partnership
  - understand both regions as common knowledge area for shared interests in energy/water/climate change
  - coupling of sustainable energy supply MENA-EU to knowledge transfer/collaboration

Concept of a joint energy/science partnership



- Research institutions as “path finders” - science building bridges
- Enhance S&T cooperation with MENA partners as stimulus to promote/deploy renewable energies in MENA
- Prospect/Vision for EU-MENA: direct physical transfer of solar energy (via high voltage DC transmission lines)
- Knowledge transfer from north-south – energy from south-north as “in-kind” contribution

Symposium Building Bridges – 19/20 May 2011
DESY - Hamburg

- Organizers:
  - DESY, Helmut Dosch, Frank Lehner
  - German Aerospace Center DLR, Robert Pitz-Paal
  - in cooperation with Egyptian Academy of Scientific Research, Prof. Dr. Maged El-Sherbiny and SESAME, Prof. Dr. Khaled Toukan
- Patronage: UNESCO
- Chairman of Advisory Board: Prof. Klaus Töpfer
- Topics
  - Climate Change, Renewable Energy and Societal and Developmental Challenges
  - Science, Sustainability and Responsibility
  - Solar Energy Projects in MENA and around the world
  - Bridging Solar Energy from MENA to Europe
  - Scientific & Educational Projects in MENA as Anchor Points for Collaboration and Capacity Building
  - Towards a Science / Energy Partnership

DLR DESY SOLAR ENERGY FOR SCIENCE

SESAME ASRT

BUILDING BRIDGES

SYMPOSIUM
19/20 MAY 2011
DESY HAMBURG
GERMANY

www.solar4science.de

United Nations Educational, Scientific and Cultural Organization

With the support of Natural Sciences Sector

ZEIT-Stiftung Ebelin und Gerd Bucerius

DESY

http://www.solar4science.de

250 participants from 30 countries
Strong MENA representation
Brought together various research communities

Signed DESY-SESAME MoU

Cyprus delegation offered follow-up symposium in December 2012 (under EC presidency)

Press Clipping

The New York Times

June 20, 2011

Can North Africa Light Up Europe With Concentrated Solar Power?

By LISA FRIEDMAN of

The first in a series.

HAMBURG, Germany -- Twenty-five years after Gerhard Knies conceived of powering Europe with the Sahara Desert's sun, the North Africa Solar project has grown into something considerably more than a mere mirage, but it's still less than a reality.

SciDev Net

Science and Development Network
News, views and information about science, technology and the developing world

Home :

NEWS

Middle East desert solar plan criticised

Mićo Tatalović
20 May 2011 | EN | FR

[HAMBURG] A plan to turn the desert sunshine of the Middle East and North Africa (MENA) into electricity, both for the region and for export to Europe, has been criticised for ignoring the needs of local people and the science community.

Berliner Zeitung

Archiv » 2011 » 24. Mai » Wissenschaft

Textarchiv

Steiniger Wüstenstrom

Auf dem Weg zu Solarkraftwerken in der Sahara gibt es noch zahlreiche technische Probleme zu lösen

Frank Grotelüschen

Riesige Solarkraftwerke in der Sahara sollen in einigen Jahrzehnten Nordafrika und Teile von Europa mit Strom versorgen. Das ist die Vision Desertec-Projekts. Seit Jahren arbeiten die Fachleute an dem Plan - doc Weg ist holprig.

8 QdS.it Comunic

Ad Amburgo un importante convegno sul futuro del solare nel mondo

In 6 ore il deserto africano riceve l'energia per un anno

Opportunità per la Sicilia per farsi ponte delle linee elettriche

Temps fort 3

Quand le désert illuminera l'Europe

issues & events

Scientists help make deserts into solar-energy hubs

Enthusiasm is high for collecting solar energy in the Middle East and North Africa, with some to be exported to Europe. But doing so requires overcoming political, social, legal, technical, and financial obstacles.

Swap solar energy from the Middle East and North Africa (MENA) for scientific equipment or access to facilities in Europe. Boost the scientific level in the region through exchanges and collaboration. Establish in Cairo a joint European–MENA solar energy center for research and implementation of relevant technologies. Power the region's scientific facilities with solar energy.

Those are among the ideas that some 250 scientists, policymakers, and others came up with in May at the Solar Energy for Science symposium held at DESY, the Electron Synchrotron laboratory in Hamburg, Germany. The atmosphere at the symposium "was really unbelievable. It was a festival," says DESY director Helmut Dosch. "You tend to get drunk from the ideas, but we have to find out what is realistic."

The Solar Energy for Science symposium in May attracted 250 attendees from 35 countries. Libya was the only Middle Eastern or North African country not represented.

AFRICA
își aprinde luminile

S&T

DESY

14 TIEDETOIMITTAJA 2 / 2011

Arja Haukkasalo

Tutkijat ovat parhaita sillanrakentajia kriisien aikana

Aurinkosähköä Euroopan tarpeisiin Pohjois-Afrikan autiomaa-alueilta

Afrikassa ja Lähi-idässä maitsa auringon paistaa 3000 tuntia vuodessa. Koska Euroopan maissa, kuten Saksassa, tuntimäärä jää tuhanteen. Suomalaiset saavat nauttia yöttömästä yöstä kesällä, mutta joutuvat turvautumaan keinovaloon talvella.

Myös tuulioloiltaan Välimeren rannikon maat ovat ympäri vuoden paremmassa asemassa kuin Keski- ja Pohjois-

poisto merivedestä vaatisivat kuitenkin paljon sähköä. Sähköä on tuotettu Arabimaissa fossiilisilla polttoaineilla, kor-

miskunnan vuoden kuluttua vastaava määrä. Edellä olevaa väitettä toistettiin myös Hampurin aurinkoenergiasymposiumissa toukokuussa 2011.

Hampurin DESY-tutkimuslaitoksessa järjestetyyn kansainväliseen aurinkoenergiasymposiumiin kokoontui satoja aurinkoenergiaan erikoistuneita tutkijoita sekä energiayhtiöiden ja niille teknisiä toimittavien yritysten edustajia

Щедрое солнце Сахары

Десертек – это план превращения солнечного тепла из пустынь Северной Африки и Ближнего Востока в электричество, в первую очередь для нужд арабского мира, а затем и Европы. Ему был посвящён симпозиум «Солнечная энергия для науки», проходивший в конце мая в Германии, в научном центре DESY.

Conclusions

- Uneven spread of knowledge and of solar energy potential between Europe and MENA
- Understand Europe and MENA as a common area to set up a common knowledge base with shared interests in energy/water and climate change mitigation

- A new energy/science EUMENA partnership
- **European RIs should join this initiative !** **ERF !**

Follow-Up “Buildung Bridges”- Congress, Cyprus 2012