

ENERGY PARTNERSHIP AFRICA – EUROPE CONCENTRATED SOLAR POWER BETWEEN TECHNICAL REALIZATION AND ETHIC RESPONSIBILITY

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With 3 figures, 2 tables and 2 photos

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Summary: Concentrating Solar Power (CSP) is technically feasible and develops towards an economically competitive alternative for conventional plants based on fossil fuels. Best locations for CSP can be found in Northern African countries, from which power could be exported to Europe using a new generation of power grids. The idea made it up to the Mediterranean Summit in July 2008, when a “Solar Plan” was initiated. This paper deals with characteristics of CSP technical realisation issues from a European energy demand perspective. Moreover, ethical questions from Northern African countries’ point of view are discussed.

Zusammenfassung: Solare Großkraftwerke (CSP) sind seit einigen Jahren technisch ausgereift und werden im Zuge der drastischen Verteuerung fossiler Energieträger zunehmend wettbewerbsfähig. Im ariden Sonnengürtel des nördlichen Afrikas liegen optimale Standorte für CSP. In räumlicher Nähe zu Europa kann dort produzierter Strom mit Hochspannungs-Gleichstrom-Trassen ohne wesentliche Leitungsverluste bis nach Zentraleuropa transportiert werden. Diese Möglichkeit wird als „Solarenergie-Partnerschaft“ zwischen Afrika und Europa propagiert und findet auch Einzug in die Agenda der 2008 geschaffenen Mittelmeer-Union. Der vorliegende Artikel beschäftigt sich einerseits mit Realisierungsmöglichkeiten solarer Großkraftwerke, andererseits hinterfragt er Rahmenbedingungen, die aus der Perspektive afrikanischer Länder bestehen müssen, um zu einer nachhaltig erfolgreichen Partnerschaft zu kommen. Diese würde sich allerdings auf die nordafrikanischen Länder beschränken. Das subsaharische Afrika wäre wieder einmal abgehängt und auf chinesische Interessen und Entwicklungshilfe angewiesen.

Keywords: Solar energy, African-European partnership, Mediterranean Union, geographical energy research, renewable energy

1 Introduction

Fossil fuels like coal, oil and gas have enabled economies to grow and develop quickly (BRÜCHER 2008, 6). Due to climate change, fossil fuel scarcity and population growth, countries of the Northern Hemisphere face severe threats to their overcome living conditions. To ensure further prosperity, among other activities a new energy mix on a sustainable foundation has to be developed. This challenge also needs an open-minded turn towards innovative approaches worldwide – even if new solutions seem to be bizarre. It may be only a question of time that renewable energy will take a leading role in power generation due to economic reasons: it will soon be cheaper than fossil fuels or nuclear plants if prices keep rising and external costs

will be internalised, for example by CO₂ sequestration, emission trading or solutions for nuclear deposits.

Looking towards Africa, solar radiance and wind conditions are extremely positive for energetic usage in its numerous deserts or its coastal areas. Solar and wind potentials are 2–4 times higher than in Central Europe (RUSNOK 2004, 289). At first sight, parts of the Sahara, Namib or Kalahari are perfect locations for large Concentrated Solar Power (CSP) plants. For example, using parabolic mirrors which focus sunlight on pipes with liquid content, state-of-the-art turbines and later power generators can easily be operated. Ideas for this technology are dating back to the 1940s (Fig. 1). Electricity can be transported to Europe with only marginal losses using a new generation of power grids.



Fig. 1: Early idea of concentrating solar power (Issue of “Popular Science”, February 1940)

Another push for CSP will be the fact that until 2050, the countries in the Middle East – Northern Africa (MENA) region will reach an electricity demand of approximately the same size as Europe today (3,500 TWh per annum DLR 2005, 154). This expected rise in energy demand leads to the question which technologies will be used for energy supply: Will it be conventional gas, oil or nuclear technologies or are the MENA countries able for “leapfrogging” towards promising new technologies like wind or concentrated solar power? CSP technological and engineering solutions are reliable and cost-effective. If the technology is available, reliable and comparatively cheap, which barriers remain for installing large numbers of CSP? Which general framework must exist in order to promote CSP as important part of the renewable energy mix?

In this paper, the first part will face aspects of technical realisation from a rather European perspective, while part two focuses on ethical questions from African countries’ point of view.

2 Technical Realisation

2.1 Technical and engineering options: PV or CSP?

In the field of solar power, two technologies can be divided: photovoltaic (PV) solutions, which need expensive solar modules to directly transform sunlight into power; or solar thermal solutions, which generate heat to launch turbines and later power generators. In 2007, PV facilities with a capacity of 1,300 MW were installed in Germany. Up to now, whole Africa’s PV sums up to 15 MW (PRESSETEXT DEUTSCHLAND 2008). Although PV installations more or less have small impact with development aid character rather than being economically feasible solutions, among the countless PV projects there are numerous good examples:

- The *Mainzer Stadtwerke* invested 1 Million EURO to built Africa’s largest PV facility near Kigali (Rwanda); 250 kW are used mainly for water pumps.
- A project of the *German Energy Agency (DENA)* in Mbinga (Tanzania) consists of a combined PV and the promising jatropha nut (*jatropha curcas*) plant oil generator (8 kW), supplying energy for 140 people.
- Fishermen at Lake Victoria traditionally used kerosene powered lamps for fishing at night. Kerosene became expensive and leaks had negative impact on the lake’s ecology. In a common effort of the *Global Nature Fund (GNF)* and the German companies *OSRAM* and *Solarworld*, PV powered facilities are used to load battery powered lamps.

In a larger scale, the concentrating solar power approach is more promising to solve general energy problems in Europe and Africa: Large, industrial scaled solar power plants (CSP) can generate electricity up to 200 MW and beyond (Photo 1). Various technologies have been developed:

- Solar towers: Using hundreds or even more than thousand movable mirrors, sunlight is focused on relatively small receiving spots on a tower. A heat exchanging system feeds a steam generator, a storage system and a power generator to provide electricity.
- Parabolic-through collectors: Again, movable concave mirrors are used, but instead of concentrating on a single point, sunlight is focussed on a variable tube system containing special heating oil which reaches up to 400 degrees Celsius (see Photo 2). Mirrors and tubes are located in



Photo 1: CSP plant in Kramer Junction, Nevada/USA. Source: Solar One

long rows and are connected via heat exchanger systems to turbines and generators. Parabolic-through CSP facilities are considered to be the most mature technology currently available on the market.

- Linear Fresnel: Similar to the Parabolic-through system, mirrors are used to heat a stationary absorber tube system. Instead of large convex mirrors, small flat units are used. Fresnel plants are still in a development process and in prototype status. Advantages compared to parabolic-through technology consist in less land use for the same energy output.
- Hybrid Plants: CSP technologies are often used in combination with gas turbines to compensate losses due to cloud coverage.
- The advantages of CSP technologies consist in economies of scale due to industrial-like, centralised plants. Using molten salt storage tanks, heat can be used up to seven hours after sundown to provide power without insolation. If a CSP is located next to the sea shore, power can also be used for desalination of sea-water (DLR 2007).

As a consequence of centralised power plants in remote deserts, far from power consumption centres, the transport of electricity rises as important topic. In various studies (DLR 2005, 2006, 2007) the *German Aerospace Center* (DLR) proved that hydrogen generation, transport and usage with losses up to 75 per cent is not competitive with the next generation of power lines (DLR 2006, 13). High-Voltage-Direct-Current lines (HVDC) with 3 to 5 GW capacity are built by *Siemens* and *ABB*, for example in China (KNIES 2008, 3). Their losses sum up to 3–5% each 1,000 kilometres, which is not only the better alternative, but also a sound basis for an African-European perspective in energy co-operation.

2.2 Locations

Concentrated solar power plants require specific locations: based on remote sensing data and a catalogue of location criteria, the *German Aerospace Center* developed an advanced Geographical Information System (GIS) driven method to identify possible CSP plant sites in the Middle East – Northern Africa region (TRIEB et al. 2002, 36). The solar “supply side” is calculated using solar radiation spatial data. Exclusion factors like slope, physical barriers (e.g. proximity to sand dunes), protected areas or forests are combined with solar radiation maps to find best suited locations. In figure 2, orange areas indicate no exclusion for CSP due to urban or industrial use, protected areas, topography, land cover or geomorphology. In case a CSP plant is projected, a weather logging station will record exact insolation data for 12 months.

According to optimistic calculations of engineers from the *German Aerospace Center*, in well performing locations, one square kilometre of desert area can be used to produce 200–300 GWhe per annum. Comparing in rough figures, this means replacing 50 MW capacity of coal or gas plants, saving the equivalent of 500,000 barrels of oil and thus avoiding 200,000 tons of carbon dioxide each year (PITZ-PAAL 2007, 8). In figure 4, blue squares indicate the theoretical size of CSP to supply power for Germany, the EU25 and the entire world. Of course, single CSP plants of that size are not realistic, but the figure illustrates the large potential of solar energy in Northern Africa.

According to the energy-from-space approach (BRÜCHER 2008), renewable energy in common and especially CSP plants will cover large areas in arid



Photo 2: CSP parabolic-through technology. Source: Solar Millennium

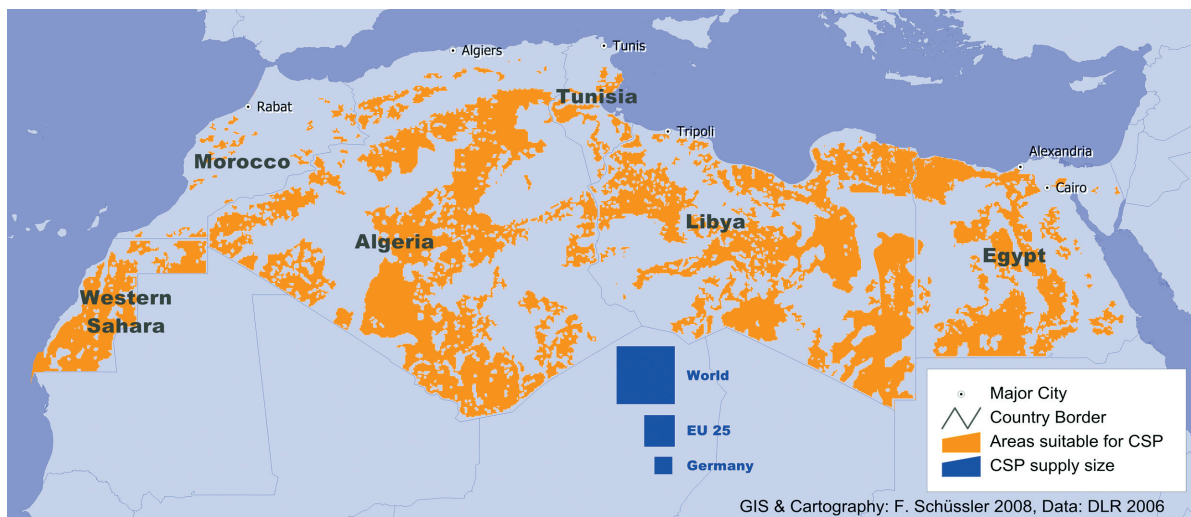


Fig. 2: Areas suitable for CSP in Northern Africa.

regions. CSP in Europe need 8 to 10 square kilometres per TWh; in MENA only 5 to 6 square kilometres per TWh are needed (DLR 2006, 120). The total land usage for the TRANS-CSP scenario in 2050 will take 1.1% area in European (DLR 2006, 122) and 0.6% in MENA countries (DLR 2005, 173). So far, no further studies on environmental impacts of CSP in desert formations are published. Due to the proposed expansion of CSP facilities, this is a major task for project developers.

The environmental impact of power lines needed for electricity export from Northern Africa to Central Europe are well described by MAY (2005). MAY based her statements on three case studies, installing power lines from Western Algeria to the German Ruhr Area, from Southern Libya to Italy and from Central Egypt to Poland. She analyses effects of overhead, underground and submarine cables and concludes that carefully planned tracks are not having a considerably negative influence on the environment. A result of the eco-balance of HVDC lines is that “each installation composed of solar thermal power plant and associated HVDC line causes distinct lower environmental pollution than the reference electricity mix” (MAY 2005, 127). Using GIS, optimisation can include all physical impacts as well as social effects, e.g. performing a visibility analysis. MAY concludes that “the general statement can be formulated that, from an ecological point of view, nothing is opposed to the expansion of solar thermal energy in North Africa and a transmission of the generated solar electricity to Europe” (MAY 2005, 128). Nevertheless, to locate new power lines in close distance to the GIS calculated optimal routes will be hard to achieve. Land properties in Europe and lo-

cal rights will be a major obstacle and may eventually lead to a more expensive investment than currently planned.

2.3 Cost-benefit analysis

Considering economical aspects of CSP, two initial remarks have to be forwarded. First, the question if CSP can be economically competitive depends on oil, gas and – to a limited extent due to low initial cost of uranium – nuclear energy prices as monetary reference for energy generation. Secondly, CSP require only investments in technical facilities and transport, none for the genuine energy source – the sun shines for free. Thus, the higher oil, gas and uranium prices rise and the longer a CSP plant can be operated, the more competitive it will be. Due to the fact that future fossil fuel prices or life cycles for CSP plants can only be roughly calculated in advance, decisions with uncertainties have to be taken within the planning stage.

The investment cost “of almost every technology becomes lower with mass production and technical development” (DLR 2005, 146). Cost reducing options can cut component cost by better design, increasing system efficiency and the number of operating hours through storage systems reducing operation and management costs by automated operation, better component lifetime and larger units (PITZ-PAAL 2007, 17). At present, the production of large mirrors and special tubes is characterized by oligopolistic or even monopolistic market structures. Market competition for CSP components would also lead to lower costs.

Reliable cost figures for a Spanish plant show that initial cost of up to 0.18–0.21 EURO per kWh are only competitive at this time, due to the Spanish feed-in tariff at exactly this amount (PTZ-PAAL 2007, 15). In better locations, using economies of scale and learning curves, improved competition with rising fossil fuel prices can be managed. For currently projected plants in Morocco, production costs of 0.10 EURO to 0.16 EURO per kWh are expected (TRIEB et al. 2002, 41). For 2020, production cost of 0.05 EURO are projected (KNIES 2008, 3).

Turning towards the general advantages of CSP plants, one has to distinguish between African and European benefits. In African countries, national income can be generated through European direct investments and newly created local jobs. Energy can be exported and precious fossil fuels can be saved for industrial processes for later generations. If CSP are combined with seawater desalination facilities, not only fresh water for direct consumption can be produced, but also water for irrigation will be available. For Europe the major aspect will be the diversification and hence security of energy supply: in the year 2000, 5 major sources of power generation existed; in 2050 there will be 10, including 7 renewables plus a HVDC import capacity of 100 GW from CSP plants in Northern Africa (DLR 2006, 111). External costs (e.g. emissions) can be reduced; also new jobs in large scales are expected. In the MED-CSP scenario DLR calculated 2,000,000 jobs in the EU-MENA region; mostly in direct combination with CSP plants (DLR 2005, 151).

Regarding the necessary new power grid, the highest costs will be transformation stations, where Alternate Current (AC) will be transferred to High-Voltage-Direct-Current (HVDC) and back to AC later. Also, new tracks have to be established. In scenarios by the DLR, investments of 5 billion EURO in 2020 would lead to transfer costs of 0.014 EURO per kWh (KNIES 2008, 3).

2.4 CSP plants

A number of plants already demonstrate the huge potential of CSP. After the first plants in the US were built, a time gap of more than 12 years occurred before Spain emerged on the CSP world map. 2008, in Spain more than 50 CSP projects with about 2,150 MW have been registered by the *Ministry of Industry*, launching Spain as leading country in CSP development worldwide (NEBRERA 2008, 2). This happens after Spain introduced its feed-in legislation for solar thermal plants up to 50 MW in 2002.

On closer examination of the power plants operating systems in table 1, similar patterns become apparent. A project developing company teams up with a financing company, acquires federal subsidies and closes long term contracts for feed-in power.

Until recently, CSP plants were only built in rich, industrialised countries. With another time gap of 5–8 years, in Northern Africa and the Middle East, first projects are set up, too. In Egypt, the World Bank acts as financier for a hybrid gas and CSP plant (gas 120 MW, solar 30 MW). In Algeria, a hybrid plant (130 MW gas, 25 MW solar parabolic-through), build by the Spanish company *Abener*, will be operating in 2010. The costs of this project (315 Mio EURO) are borne by the investor *New Energy Algeria (NEAL)*. In Morocco, the *Ain-Beni-Mathar* project (450 MW gas, 20 MW solar) will be realised until 2012. In Aquaba, Jordan, a 10 MW plant is projected, offering 40 MW for cooling and 10,000 cubic metres of desalted water (TRIEB and MÜLLER-STEINHAGEN 2007, 29). It seems like CSP technology is going to conquer developing countries now, being pushed by specialised consulting, project management and technology companies, supported by political will.

Among future project ideas, one is as well promising as provoking: According to a sub-organisation of the *Club of Rome*, in the Gaza strip a 1 GW CSP

Table 1: Examples for existing commercial CSP plants

Plant name	Location	Year built	CSP type	Solar power	Size	Owners	Cost	Storage
Andasol	Granada (ESP)	2008	Parabolic-through	50 MW	2 sqkm	ACS/Cobra (ESP), Solar Millenium (GER)	300 Million EURO	7.5 h
SEGS I–IX	Nevada (USA)	1984–1991	Parabolic-through	354 MW	6.4 sqkm	FPL Energy (US)	1.2 Billion USD	-
Solar One	Nevada (USA)	2007	Parabolic-through	64 MW	1.6 sqkm	Acciona (USA)	266 Million USD	-
Solucar	Seville (ESP)	2008	Solar tower + gas	11 MW	0.75 sqkm	Abengoa (ESP)	No data	0.5 h

and water project is projected to enhance the regions infrastructure and its political stability. The cost of 5 billion EUROS should be financed by the international community, organised by an international *Gaza Recovery Agency (GARAGE)*. Although this is an interesting approach to face regional problems in that area, obstacles are very high and a realisation of this project would be an international surprise.

2.5 Actors and stakeholders

Up to now, in the private business sector large, market dominating energy companies do not prefer CSP technologies due to their current power plant structure setup: CSP plants provide base load and, thus, are substitute facilities for oil, coal and nuclear plants which are still operational. The market is still dominated by small and medium-sized businesses, mostly newcomers from the US, Spain and Germany.

No doubt, the most prominent and active actor in the field of CSP endorsement is the *Trans-Mediterranean Renewable Energy Cooperation (TREC)*. TREC is an initiative of the *Club of Rome*, a Hamburg-based climate protection fund and the *Jordan National Energy Research Center (NERC)* as international network of scientists and politicians. In the so called DESERTEC concept, power from CSP is seen as addition to a network of renewable energy sources that supply Europe, the Middle East and Northern Africa. It is aimed to set up a “competitive, secure and compatible supply [...] using renewable energy sources and efficiency gains, and fossil fuels as backup for balancing power” up to the year 2050 (TRIEB and MÜLLER-STEINHAGEN 2007, 23). Each renewable energy category should be used at optimal locations: wind along the coasts from Norway to Morocco, biomass in Central Europe’s large forests, hydro power in mountainous regions, geothermal power (hot dry rock technology) in suitable spots and solar power at fair latitudes. As a key to such an intercontinental energy system, an interconnection of the power grids of Europe, the Middle East and Northern Africa is proposed to mix renewable energy sources on a larger scale than today. Various similar DESERTEC networks are planned, not only in the EUMENA region, but also in Australia, China, India and Northern America.

TREC members value the DESERTEC concept as Apollo-like programme. Its realisation is planned in two major steps: the first one is supposed to be the large scale production and deployment of solar power

plants in the MENA region. Afterwards, the interconnection of MENA and Europe with a Supergrid for multi-GW power transfer will be realised. TREC augments its concept in a white paper (KNIES et al. 2007) and three major studies, compiled by the *German Aerospace Center*: MED-CSP (DLR 2005), TRANS-CSP (DLR 2006) and AQUA-CSP (2007).

Until 2008, from the African or Middle East countries perspective, only a short passage in the TREC White Book is published (KNIES et al. 2007, 45–55). According to these brief statements, governments and stakeholders in Morocco, Tunisia, Algeria and Egypt positively respond towards the CSP concept, although between the lines, it is a truly European perspective.

In this chapter, we learned that CSP technology is applicable. Economies of scale and optimal locations can lead to competitive energy prices. As a result of an African-European partnership, benefits in both European and selected African countries can be generated. In the scientific community engineers and natural scientists appear as optimists concerning CSP as part of an African-European partnership. Why do social and historical scientists still play the role of pessimists regarding an African-European solar partnership?

3 Ethic responsibility

3.1 Colonial heritage

Without resting in simple historical victim-offender dichotomies (SPEITKAMP 2005, 12), it is obvious that until today the colonial heritage of European countries is present in the minds of the majority of African people (COLLIER 2008). Africa was split among French, British, Belgian, Spanish, Portuguese, Italian and German colonial powers. Northern African countries received their independence from France in 1956 (Morocco and Tunisia), 1962 (Algeria), from Italy in 1951 (Libya) and Great Britain in 1922/1936 (Egypt). Since then, EU and Africa did not succeed to create sustainable economic growth and social development in large parts of Africa. Moreover, most of the African continent can not participate in the globalised economy – except for being exploited again by countries of the Northern Hemisphere due to its desired resources (KAPPEL 2008, 2). Because of that, large infrastructure projects like CSP have to prove their participatory character, while simultaneously they have to be economically successful and sustainable.

According to these historical reservations, every European effort to collaborate with African countries will always be suspicious to be a one-way business. Answering this new colonialism rebuke, the DESERTEC concept denies the CSP installations to be considered as exploitation: “the current situation is an exploitation of gas and oil, but solar energy is practically unlimited and can’t be exploited” (KNIES 2008, 6). Additionally, KNIES names “earnings from export of electricity” and jobs as additional income for MENA countries, plus the benefit of “technology transfer and development of training programs and studies for renewable energy” (KNIES 2008, 6).

Opposite to these conditions, China, without a colonial history in Africa, acts in direct partnership (“oil for aid”) with every regime that promises to return payment in form of fossil or mineral resources immediately (SCHÜLLER and ASCHE 2007, 6).

3.2 Development traps and the Euro-Mediterranean partnership

The current structural weakness of most African countries can be described and explained by a number of development traps (COLLIER 2008): poverty, low productivity, bad neighbourhood, wrong trading priorities and a strong economical focus on the export of resources. To get out of these traps, African countries need decades of fast growth rates to get rid of economical underdevelopment and structural instability (KAPPEL and MÜLLER 2007).

A promising approach is the Euro-Mediterranean Partnership signed in July 2008. Following the Barcelona Process, governments of European, Northern African and Middle East countries try to “revitalise efforts to transform the Mediterranean into an area of peace, democracy, cooperation and prosperity” (EURO-MEDITERRANEAN SUMMIT 2008, 8). Maybe this initiative is also driven by a certain amount of fear: according to a study of the German Institute for International and Security Affairs, Africa is just seen as a danger due to increasing migration; it is not mentioned as potential business partner on a par with Europe (SCHRÖDER and TULL 2008).

Regarding CSP, in the Joint Declaration of the Paris Summit a “Mediterranean Solar Plan” has been proposed: “the recent activity on energy markets in terms of both supply and demand, confirms the need to focus on alternative energy sources. Market deployment as well as research and

development of all alternative sources of energy are therefore a major priority in efforts towards assuring sustainable development. The Secretariat is tasked to explore the feasibility, development and creation of a Mediterranean Solar Plan” (EURO-MEDITERRANEAN SUMMIT 2008, 19).

Behind the question if good deeds will follow this political intention and deserts will turn into a sea of mirrors, Sub-Saharan countries are going to be left behind. Economic development continues to focus on Northern and Southern African countries, with “the vast mass of Sub-Saharan Africa – arguably the region that has most to gain from renewable energy – largely unexploited” (UNEP 2008, 59). Neither connected with Europe by geography nor being included in political initiatives, large parts of the continent will remain in the last row of European partners – although in tropical African countries water power and in Southern African countries again CSP have great potential to ensure power supply as development foundation.

3.3 Clean Development Mechanism (CDM)

Africa’s economic slumber (Tab. 2) can be substantiated looking at the Clean Development Mechanism (CDM) as one of three instruments following the Kyoto Protocol besides joint implementation and emission trading. CDM enables industrialised countries – which signed the Kyoto Protocol – to invest in emission reducing projects in developing countries. Its products are Certified Emission Reductions (CER) which can be internationally traded. Looking at figure 3, only 2.2% of worldwide registered CDM projects in developing countries are located in Africa. So far, CDM is hardly used across the continent and no CSP projects are financed.

Is this CDM disparity an indicator for a lack of regional investment security? Looking at the CDM investment climate index published annually by the *German Investment and Development Society* (DEG 2008), only three of 54 African states achieve a “good” score (South Africa, Tunisia and Morocco), another three states receive a “fair” grade (Egypt, Nigeria and Uganda). All other states have poor chances to participate in the global run for CDM investments. Moreover, the *Freedom House* report claims that most African countries are “not free” or “partly free” regarding political rights and civil liberties (FREEDOM HOUSE 2008).

Table 2: Indicators for development status, political status and investment security in Northern Africa

Country/ Region	GDP (1)	GINI (2)	HDI (3)	IMR (4)	FS (5)	ER (6)	Kyoto (7)	CDM ICI (8)
Algeria	7062	35	0.73	34	Not free	98	2005	49
Egypt	4337	34	0.71	28	Not free	98	2005	70
Libya	10335	82	0.82	18	Not free	97	2006	34
Mauritania	2234	39	0.55	78	Partly free	-	2005	37
Morocco	4555	36	0.65	36	Partly free	85	2002	75
Tunisia	8371	40	0.77	20	Not free	99	2003	78
Subsaharan Africa	1998	> 50	0.49	102	Mostly not free	26	-	< 40
<i>Germany</i>	<i>29461</i>	<i>28</i>	<i>0.94</i>	<i>4</i>	<i>Free</i>	<i>100</i>	<i>2002</i>	<i>-</i>
<i>France</i>	<i>30386</i>	<i>33</i>	<i>0.95</i>	<i>4</i>	<i>Free</i>	<i>100</i>	<i>2002</i>	<i>-</i>

(1) Gross Domestic Product per Capita, Source: UNDP (2008), (2) GINI-Index, Source: UNDP (2008), (3) Human Development Index, Source: UNDP (2008), (4) Infant Mortality Rate (per 1000 live births), Source: UNDP (2008), (5) Freedom Status, Source: Freedomhouse.org (2008), (6) Electrification rate, Source: UNDP (2008), (7) Year of Kyoto protocol signed, Source: UNDP (2008), (8) CDM Investment Climate Index, Source: DEG (2008)

3.4 Risk minimising strategies

Looking back north again, European energy policy goals consist of competitiveness, diversification of the energy mix, solidarity in a global community, sustainable development, innovation and technology and a common external policy (EU 2006, 4–5). Instruments for achieving these goals are feed-in tariffs, renewable portfolio standards and funds, competitive bidding, renewable energy certificates, green power purchasing and the already mentioned Kyoto instruments. Important for an African-European partnership using CSP is the fact that Europe seeks to improve its energy diversity in order to escape dependencies from fossil fuels and to ensure its security of supply at reasonable cost. It is a risk minimising strategy.

In economic terms, risk is best measured by price volatility (DLR 2006, 115). The TRANS-CSP study claims that the short or mid term demand for low cost energy plants has not increased energy security because of dependencies from – until recently – cheap oil, gas or uranium. In the TRANS-CSP scenario, the cost of imported solar power will be lower than energy based on conventional carriers from 2020 on (DLR 2006, 117). Due to drastically increased oil prices since the DLR study completion, the day solar energy is cheaper than fossil energy will come earlier than expected.

4 Conclusions

From a technical and monetary point of view, the time for CSP projects in Africa has come or will come in the near future. Alas, most African countries are not prepared for investments in larger scale. African countries involved in the “Mediterranean Solar Plan” (Algeria, Egypt, Mauritania, Morocco, Tunisia and Libya with its observer status) will be first choice for investors. Tunisia and Morocco are having best opportunities for investments. Sub-Saharan Africa is cut off and remains dependant from northern development aid or Chinese ventures.

What will happen in these fortunate Northern African countries, if larger numbers of CSP projects and foreign investments will be attracted? A suggestion to policy and decision-makers can be that “pilot projects with relatively new technology input in a rural area should reconsider the importance of culture, capacity development and the level of income of the end users at the initial planning stage and implementation” (BIKAM and MULAUDZI 2006, 1561).

So called “travelling models”, which mean applying technological and organisational solutions from one spot to the other without considering local particularities, will not be successful. Besides optimistic engineers and politicians, for a sound CSP project development critical social scientists, geographers and historians are needed to embed important “soft” aspects into the process.

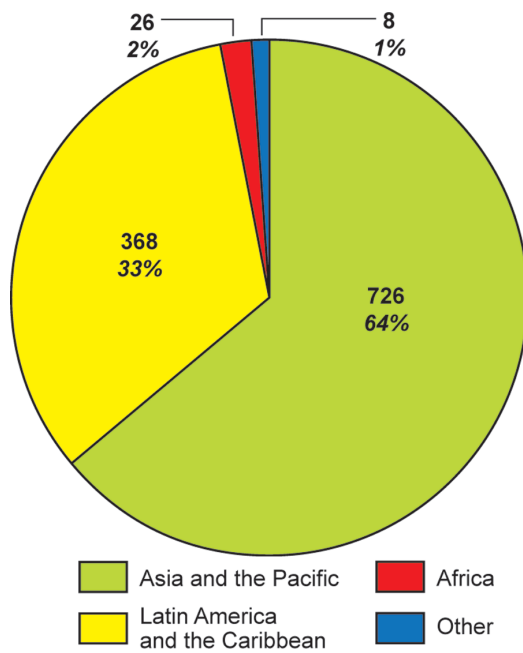


Fig. 3: Registered CDM projects by region.
Data source: UNFCCC

How will additional income be distributed? If we look at the GINI coefficients of the most promising countries, figures of Tunisia (39.8) and Morocco (39.5) show that income distribution is not much worse than in Spain or Portugal. CSP projects could boost these countries' economies, lifting earnings for wide parts of the population and generating new jobs.

Obstacles for implementing a large number of CSP plants in African countries persist in the field of historical reservations (accusations regarding re-colonialisation), political worries (local government reliability) social questions (socio-economic effects) and environmental uncertainties (impacts). It is necessary to discuss CSP projects and its effects intensively and to pave the way for the realization of this revolutionary idea (TÖPFER 2007, 8).

The Euro-Mediterranean Partnership may lead to new projects in Maghreb states, but Sub-Saharan Africa with 547 million people without electricity (UNEP 2008) will be left behind again. To boost CSP into practice, countries with natural opportunities, countries with high energy demand and with technology competence must co-operate (PRINCE HASSAN BIN TALAL 2007, 6). As accompanying measures, business developers need to get to know the regional and local societies and plan all commercial

processes in detail while carefully participating local stakeholders and integrating them into the designed planning process. If this can be ensured, CSP will contribute to a new energy mix and simultaneously will bring positive socio-economical effects into its hosting countries.

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