Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

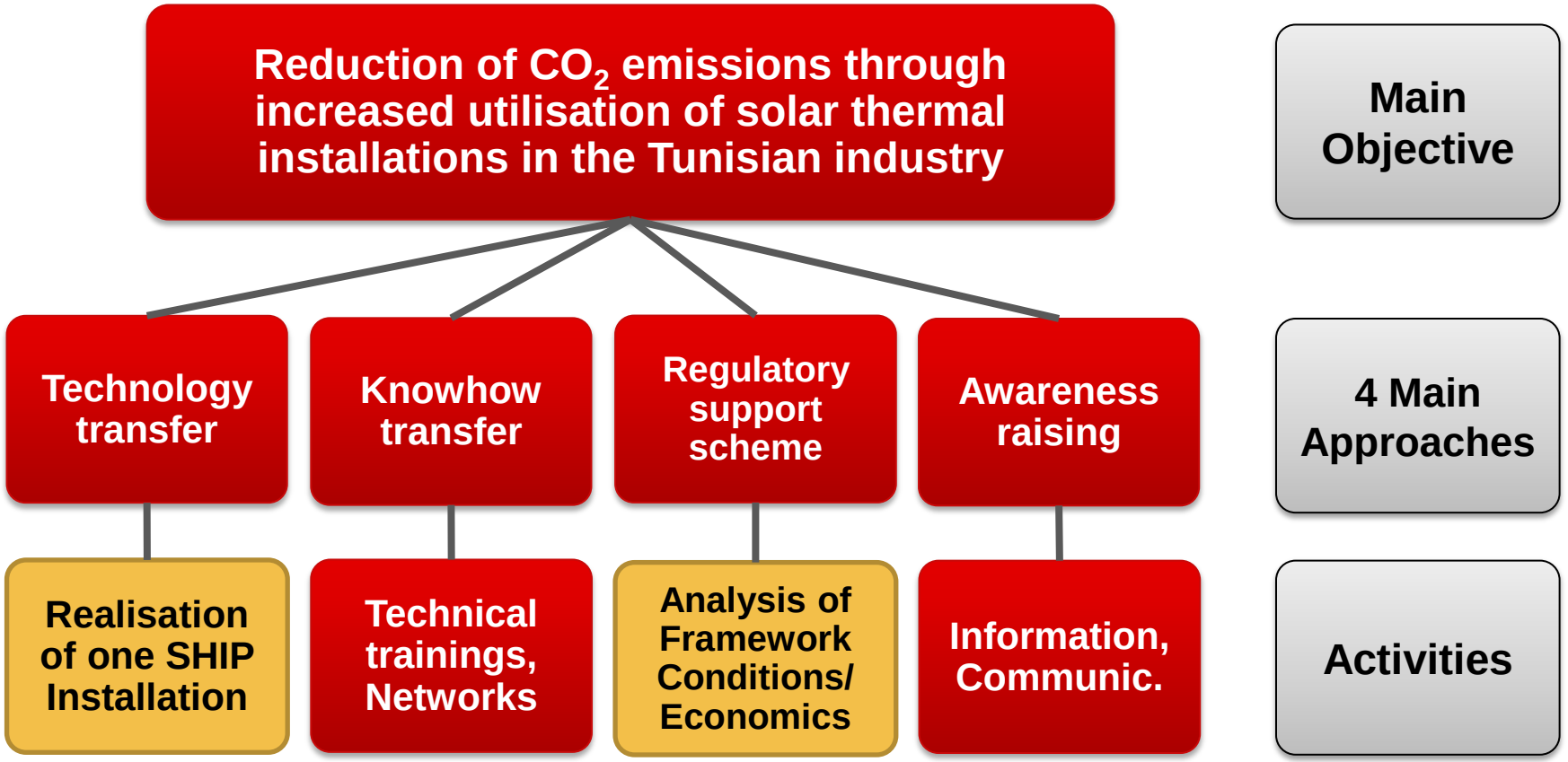
Dissemination of Innovative Solar Thermal Applications in the Tunisian Industry (DASTII)

Results of Prefeasibility Studies for Solar Heat in Industrial Processes (SHIP) in Tunisia

DASTii
Diffusion des Applications Solaires Thermiques Innovantes dans l'Industrie Tunisienne

Kick-off Opportunity Study 26.09.2014

The DASTII Project



SHIP Installation Project

- Realisation of a SHIP installation in a Tunisian industrial company
- **Objectif: Fuel Savings equivalent to 250 t CO2 / year**
- Utilisation of a concentrating collector technology at medium temperature level (> 150°C)
- Potential branches: Food, Beverage, Textile, Chemics, others

Selection process of industry partner for SHIP Project

1. Preselection	• Preselection of 20 industrial companies based on prior analysis (Potential Study) • Representation of most relevant branches (Food, Textile, Chemical, Brick)
2. Site Visits	• Verification of site conditions, level of interest • Collection of technical data via questionnaires → Selection of 5 most favorable candidates
3. Energy Audits	• Thermal energy measurements on site • Set-up of daily and annual **energy demand profile**
4. Prefeasibility Study	Techno-economic assessment of SPH integration on 5 sites (Conducted by: Fraunhofer ISE)
5. Feasibility Study	Selection of industry partner through detailed study

Prefeasibility Study - Assumptions

- → Solar plant saves gas/fuel equivalent to 250t CO2/year
- → Payback Period for company/client: 5 years
- → Use of a concentrating collector technology

Technical Assumptions	
Collector technology	Fresnel
Degradation (%)	0,5
Life Time (a)	20
O&M costs/ Inv. Costs (%)	1
Specific Costs (€/m²)	550

Financial Assumptions	
Equity Share	80%
Debt Share	20%
Cost of Equity	14%
Cost of Debt	8%

Energy Prices	
Nat. Gas Cost [€ct/kWh]	**1,76***
Fuel Oil Cost [€ct/kWh]	**2,5***
Energy Price Increase *per year* [%/a]	**10%**

Solar Irradiation	
DNI (kWh/m²/a)	1850 (North) 2000 (Center)

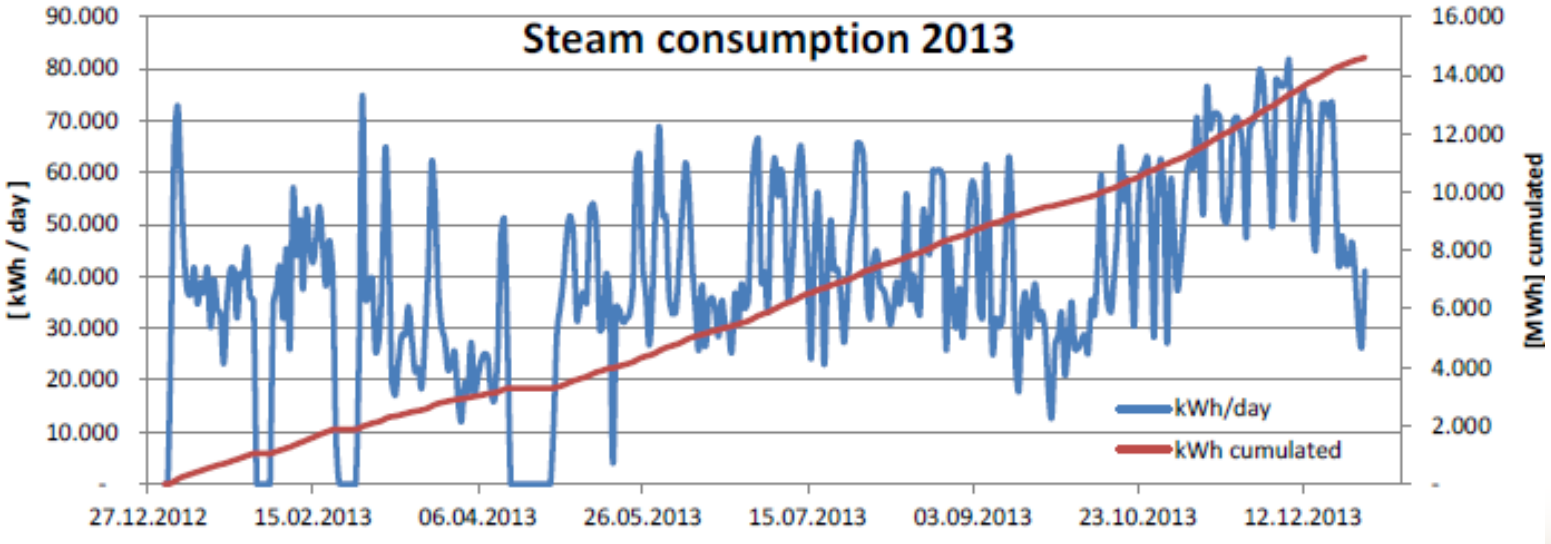
→ 17 ct/kWh after 20 years

*** Current Tunisian energy prices incl.VAT (09/2014) plus 10% (assumed energy price increase in 2015)**

1. Food Production Company

Sector: Food Industry
Location: North Tunisia
Heat source: Fuel Oil
Heat supply: Steam at 180°C
Processes: Drying (110°C), Sterilisation (130°C)

Energy Profile: 24h/d, 7 d/w., **339 d/a**
Energy demand: High, fairly constant

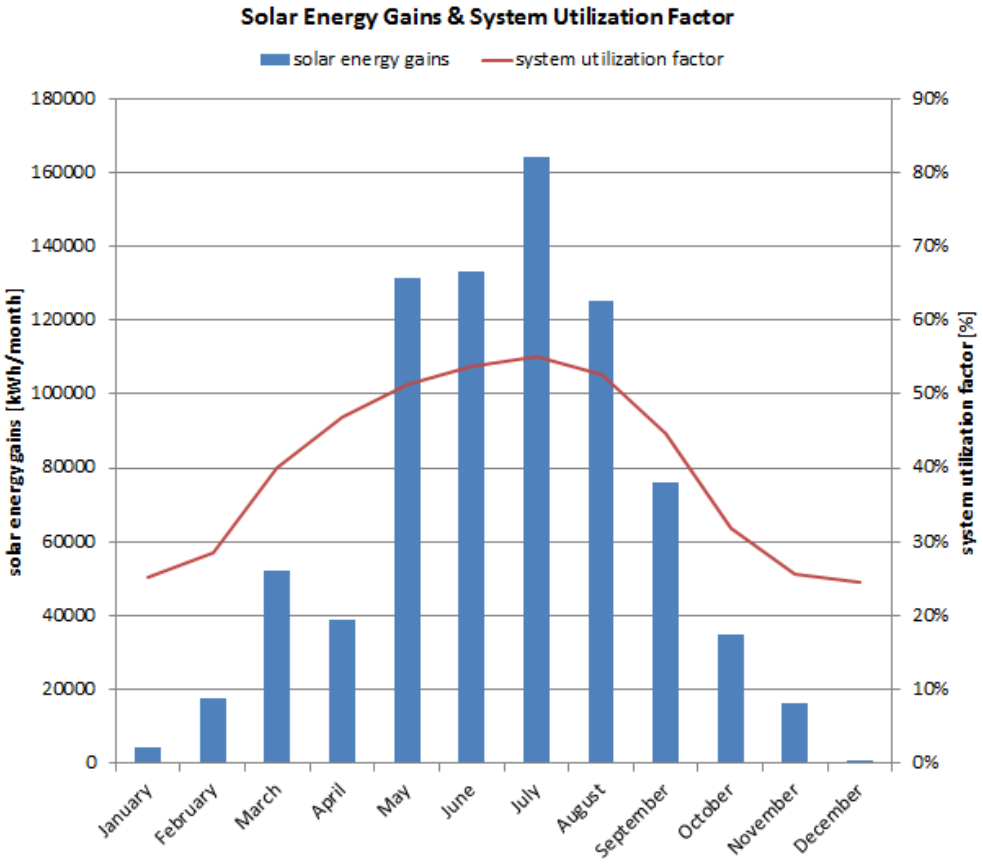


1. Food company - Results

For CO2 reduction of 250 t/a:

Solar Field Size: 1.250 m²
System Utilisation: 34%
Solar Fraction: 3%

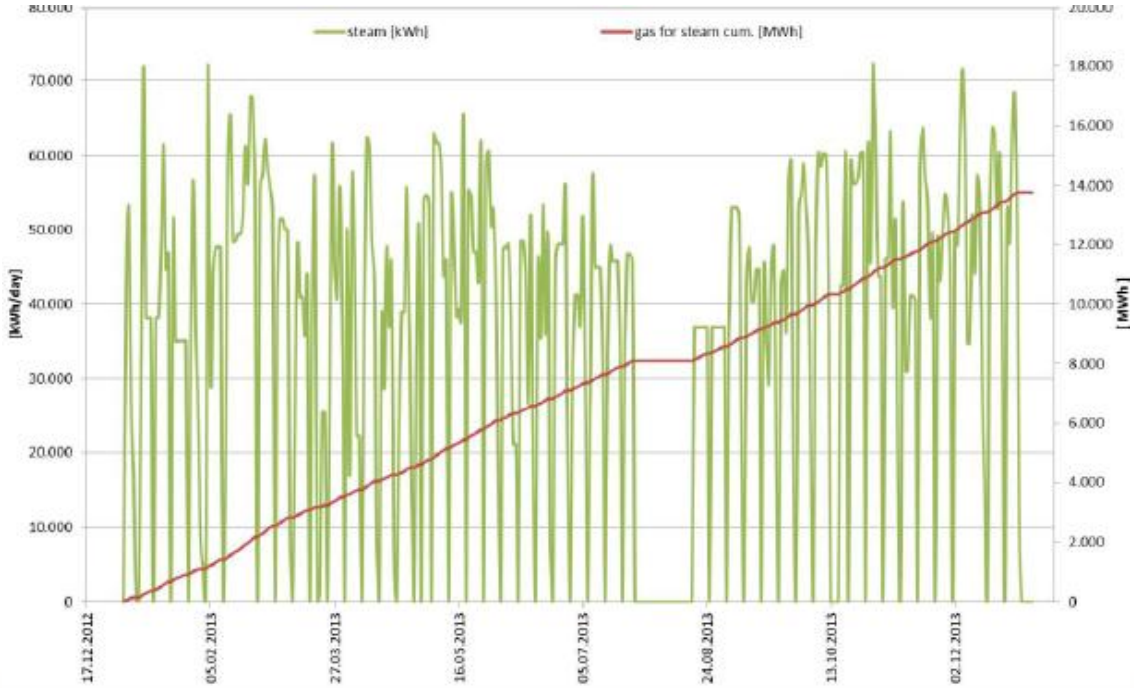
Total Investment: 740.000 €
Payback Period: 18 years
Required Subsidy (PBP = 5 y): ca.88%



2. Textile Company

Sector: Textile industry
Location: North Tunisia
Heating source: Natural Gas
Heat supply: Steam at 165°C
Processes:Washing (90°C), Whitening (90°C), Dyeing (90°C)

Energy Profile: 16h, 6 d/w., **283 d/a**
Energy demand: Medium, fluctuating

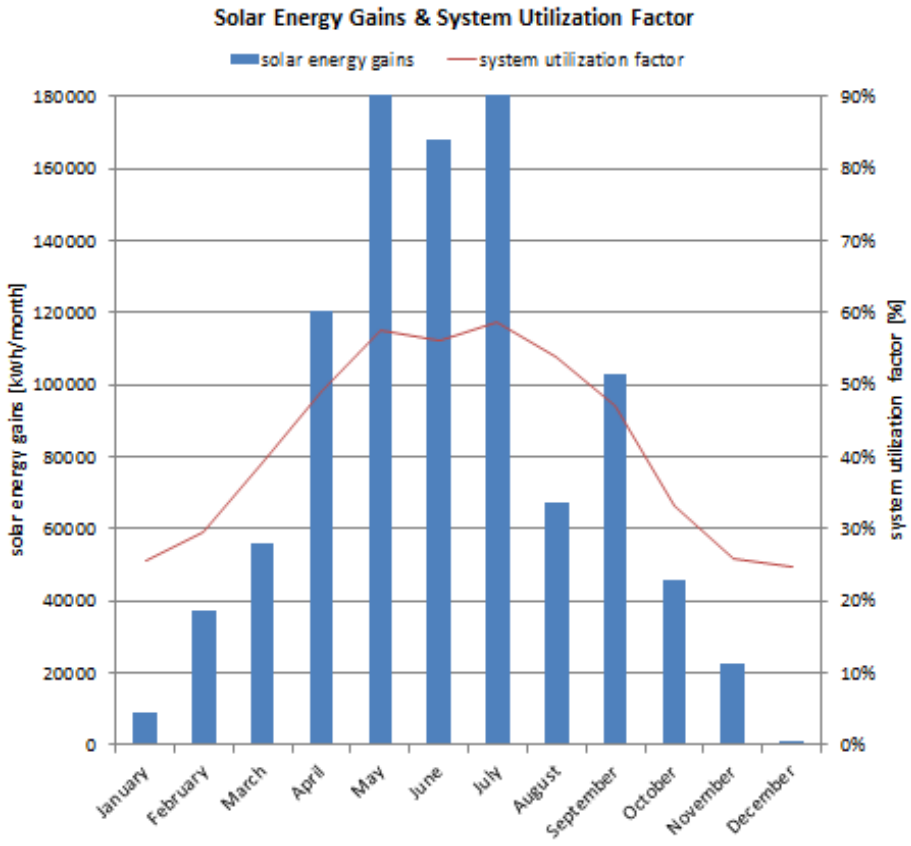


2. Textile company - Results

For CO2 reduction of 250 t/a:

Solar Field Size: 1.850 m²
System Utilisation: 29%
Solar Fraction: 10%

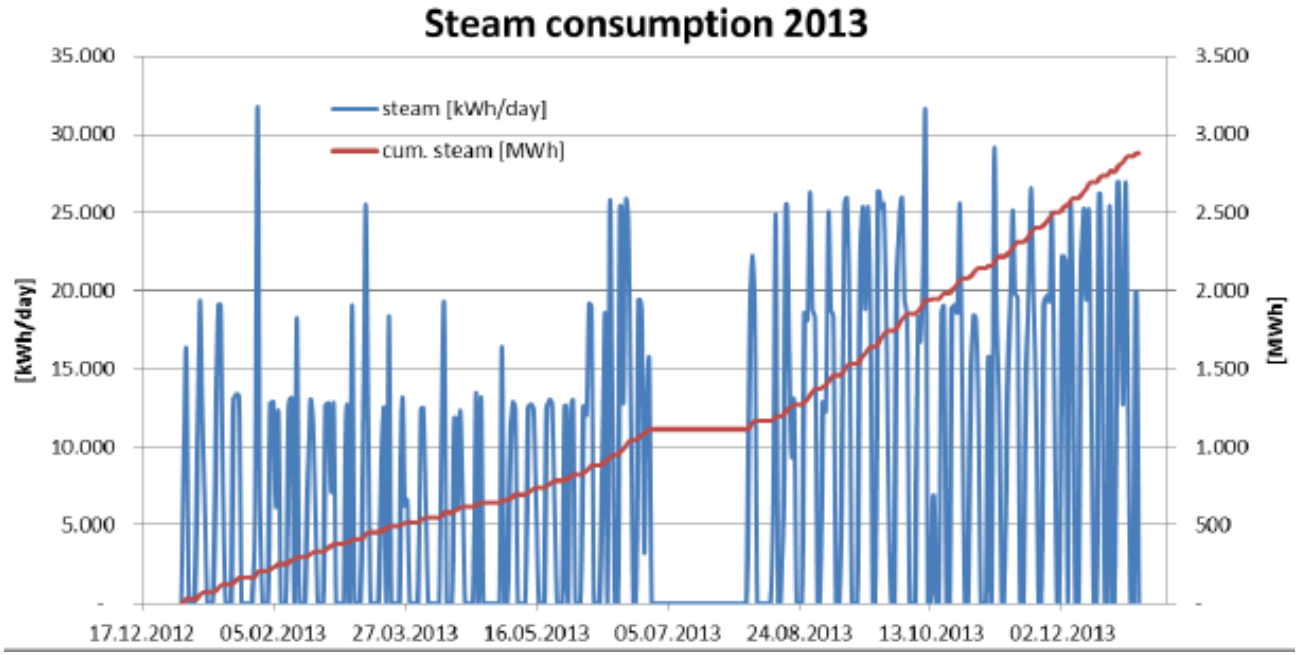
Total Investment: 1.070.000 €
Payback Period: 22 years
Required Subsidy (PBP = 5 y): ca. 92%



3. Tobacco Company

Sector: Tobacco production
Location: Central Tunisia
Heating source: Heavy Fuel
Heat supply: Steam at 180°C
Processes: Humidification (90°C), Drying (90°C)

Production Profile: 10h, 5 d/w., 178 d/a
Daily profile: 5 a.m. – 14:30 p.m.
Energy demand: Low, highly fluctuating

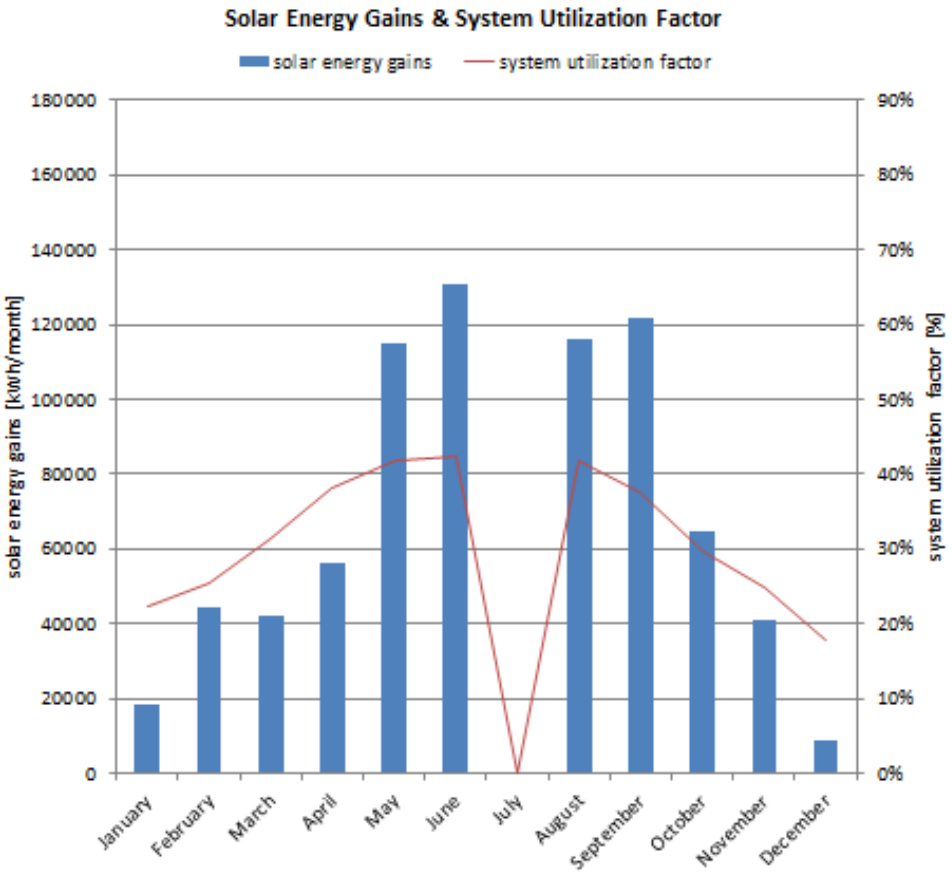


3. Tobacco company - Results

For CO2 reduction of 250 t/a:

Solar Field Size: 3.150 m²
System Utilisation: 12%
Solar Fraction: 25%

Total Investment: 1.780.000 €
Payback Period: 27 years
Required Subsidy (PBP = 5 y): ca. 94%



Expected results of the opportunity study

- Details on current SHIP system costs and cost distribution
- Influence of collector technology, integration method, application (energy profile), storage on economics → Simulation
- Identification of potential market niches
- Definition of minimum framework conditions for market development

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
Tunis, Tunisia
Project DASTII
info@dastii.de
www.giz.de | www.dastii.com