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# MOBILIZING CLIMATE INVESTMENT

*Annex 3 - Solar Water Heaters in Tunisia*

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## CONTEXT

Tunisia has significant potential for solar power. Although solar thermal panels could satisfy approximately 70–80 percent of sanitary hot water needs in the residential sector, in the early 2000s 78 percent of residential hot water needs were met through subsidized, imported liquefied petroleum gas (LPG)–fired boilers (Menichetti and Touhami 2007). Since the 1980s the government of Tunisia has been interested in exploiting renewable energy to meet its growing energy demand and reduce reliance on fossil fuels. However, there are a number of barriers to exploiting renewable energy, including significant subsidies on fossil fuels and lack of financing availability, despite sophisticated financial and credit markets. Furthermore, consumers lacked awareness of (and confidence in) solar water heaters as an alternative to LPG–fired boilers (Olz 2011).

## EFFORTS TO CREATE AN ENABLING ENVIRONMENT

### Early efforts

The Tunisian government began to promote solar water heaters in the 1980s, developing the first solar thermal energy strategy in 1984 and establishing the National Energy Management Agency (ANME) in 1985. In the early 1990s the government enacted a number of laws to promote energy conservation and renewable energy (Trabacchi et al. 2012).<sup>1</sup> However, these efforts had limited impact due to problems with the quality and maintenance of the equipment (Olz 2011).

In 1996 ANME implemented a project with support from the World Bank to subsidize 35 percent of the capital cost of solar water heaters to commercial (public and private) institutions and later to the residential sector (World Bank 2004). The project included a technical assistance component for public awareness and promotions, and monitoring and evaluation assistance to improve quality and maintenance and to build public confidence. The project successfully stimulated market growth and resulted in the installation of 50,000 square meters of new solar thermal panels. However, when international support ended in 2002, the solar water heater market collapsed from 17,000 square meters installed in 2001 to 7,500 square meters in 2004 (Olz 2011). This was attributed to a project design that did not consider the long-term sustainability of the initiative,<sup>2</sup> and other barriers, including the commercial immaturity of the solar water heater market, fossil fuel subsidies, lack of financing availability, and lack of consumer confidence in domestically manufactured systems (Olz 2011).

### Prosol launched with supply side incentives

In 2005 the Tunisian Minister for Industry, Energy and Small and Medium Enterprises and ANME initiated the “Program Solaire” (Prosol). The program was supported with \$2.2 million from the Italian Ministry of the Environment for the Protection of Land and Sea (MATM), as well as technical support from UNEP through the Mediterranean Renewable Energy Programme Finance Initiative. The Prosol financing scheme involved the provision of loans by commercial banks to residential consumers through accredited

## BOX 1 | HIGHLIGHTS

- A 1996 project supported by the World Bank—with funding from GEF and the Belgian government—promoted the use of solar water heaters through a 35 percent subsidy on the capital cost. It was successful in stimulating market growth while funding lasted, but did not lead to sustained results, as a number of barriers remained.
- The government of Tunisia initiated the “Program Solaire” (Prosol) in 2005. Prosol provided a subsidy on the capital costs of solar water heaters and loans at a reduced interest rate by commercial banks to residential consumers, which were repaid via the state electricity utility (STEG) through the electricity bill. It also undertook awareness-raising campaigns targeted at consumers and commercial banks and provided capacity building to financial institutions and technology providers to develop long-term knowledge and expertise.
- In 2005 the Tunisian government passed a law providing for a 20 percent capital cost subsidy for solar water heaters installed in the residential sector. The law established a National Fund for Energy Conservation (FNME) to support renewable energy and energy efficiency initiatives, to be funded through tax revenues from motor vehicle registrations and customs duties on air-conditioning systems.
- Prosol entered a second phase in 2007 with \$21.8 million in funding from the Tunisian government and \$0.2 million from the Italian government. By 2010, annual deployment of solar water heater systems had increased fivefold since the start of the initiative. Total public and private investment in the program amounted to an estimated \$134 million, of which the public sector provided 18 percent, while 82 percent was provided by local private investors, a leverage rate of \$5 of private capital for every \$1 of public resources.
- In 2009 the government launched the Tunisian Solar Plan 2010–2016, which aims to increase the share of renewable energy in total electricity production by 16 percent, and achieve 25 percent in energy savings by 2016, funded primarily through the domestic private sector.



system suppliers. The loans were repaid via the state electricity utility (STEG) through the electricity bill. This innovation helped secure the engagement of local financial institutions by reducing the risk of default and allowing banks to offer loans to households with softer credit conditions and longer repayment terms from three to five years (Trabacchi et al. 2012). It also reduced the transaction costs for banks, as STEG managed all the paperwork and credit checks.<sup>3</sup>

In the first two years, the program provided \$1 million each for a 20 percent subsidy on the capital costs of solar water heaters and a temporary interest rate subsidy, which was gradually phased out after 18 months. The latter aimed to create incentives for householders to apply for favorable credit terms to purchase solar water heater systems, and to help banks rapidly achieve a critical mass of loans. The program also provided \$0.2 million for readiness activities to address barriers to the adoption of the solar water heater market, including:

- Awareness-raising campaigns targeting consumers to address concerns about solar water heaters, and to commercial banks to provide information about renewable energy investments and associated market potentials.
- A capacity-building strategy to strengthen the knowledge and expertise of Tunisian financial institutions and technology providers.
- An accreditation scheme for suppliers and installers and solar water heater models, as well as monitoring procedures to ensure the quality and reliability of systems, which are important factors in stimulating and sustaining demand.

In its first two years, Prosol had a rapid and visible impact on market development: by the end of 2006, 57,000 square meters of solar water heater systems had been installed, the number of equipment suppliers, manufacturers, and installers increased rapidly, and bank loans (by two partner financial institutions) to 20,000 households represented a value of more than \$12 million, leveraging the program cost five-fold (Olz 2011).

In 2005 the government of Tunisia passed a law making solar water heater systems installed in the residential sector eligible for a 20 percent capital cost subsidy. It was the first policy intervention of its kind; energy subsidies had previously exclusively targeted fossil fuel sources. The law also created a National Fund for Energy Conservation (FNME) to support renewable energy and energy efficiency initiatives, to be funded through tax revenues from motor vehicle registrations and custom duties on air-conditioning systems, and mandated the use of solar water heater systems in new public buildings.

### Prosol relaunched with demand side incentives

A second phase of Prosol was launched in 2007, supported mainly by the Tunisian government with a small supporting grant of \$0.2 million provided by MATTM. The second phase introduced a key improvement in the financing mechanism by lending directly to households via STEG (instead of through suppliers as in the first phase), thereby placing STEG in the role of guarantor of households and removing debt default risks from suppliers. STEG was more suited to bearing this risk because it had the power to enforce payments by suspending power services to defaulting households (Trabacchi et al. 2012).



In addition, in February 2009 the government changed the incentive framework from the 20 percent subsidy to a bonus of \$150 to \$300 depending on the size of the system. This change was designed to overcome a slight impasse observed in sales when the funds granted by the MATTM ended, and to promote market diversification by making the product more attractive to low-income households (Trabacchi et al. 2012).

By 2010, more than 119,000 solar water heater systems totaling around 355,350 square meters were installed in Tunisia, with a fivefold increase in annual deployment compared with that under previous initiatives. Total public and private investment in Prosol between 2005 and 2010 amounted to an estimated \$134 million (including an estimated \$21.8 million in funding from the government to cover the capital cost subsidy), of which the public sector provided 18 percent, while 82 percent was provided by local private investors, a leverage rate of \$5 of private capital for every \$1 of public resources. Furthermore, the shift in consumer demand reduced the government's fossil-fuel subsidy spending by an estimated \$15.2 million (Trabacchi et al. 2012).

### Prosol reorganized by sectors

The government recently developed three offshoots of Prosol targeting the tertiary, industrial, and residential sectors.

**Prosol Tertiary**, launched in 2008, promotes the adoption of solar water heaters in the tertiary sector (such as tourism establishments) through a 30 percent capital cost subsidy funded through the FNME, an additional 10 percent premium on the capital cost and a two percent per year subsidy on the interest rate (funded by the MATTM through MEDREP), and support for the maintenance of solar water heaters (Marrouki 2012). Prosol Tertiary has enabled the installation of around 5,000 m<sup>2</sup> of solar water heaters between 2008 and 2010 (Marrouki 2012) and 15,000 m<sup>2</sup> of solar water heaters from 2010 to 2012 in the tertiary sector (Baccouche 2013).

**Prosol Industry**, launched in 2009 and still in its pilot phase, promotes the adoption of solar water heaters in industry through a capital cost subsidy of 30 percent funded by the MATTM through MEDREP.<sup>4</sup> The feasibility study has been completed (with support from UNEP through MEDREP) and the first solar thermal unit was expected to be in operation by the end of 2013 and consisted of a 955 m<sup>2</sup> installation in the textile sector (Baccouche 2013).

**ProsolElec**, launched in 2010, promotes the adoption of solar panels in the residential sector through a 30 percent subsidy on the capital costs of the photovoltaic system (funded through the FNME); an additional premium of 10 percent of the capital cost funded by the MATTM through MEDREP; and a subsidized loan with zero percent interest rate for five years, repayable through via STEG through the electricity bill (Marrouki 2012). Furthermore, STEG covers the cost of the inverter (roughly 20 percent of the cost of the system).<sup>5</sup> ProsolElec is intended to use a net metering system in the future, whereby customers generating electricity can sell the excess to the grid and receive a credit on their electricity bill (Marrouki 2012).

### Looking forward: Tunisian Solar Plan 2010-16

In late 2009, the government launched the \$2.2 billion (TND 3.4 billion) Tunisian Solar Plan (TSP) 2010-2016, which is also proposed as Tunisia's nationally appropriate mitigation action (NAMA) under the UNFCCC.<sup>6</sup> The plan aims to increase the share of renewable energy in total electricity production by 16 percent, and achieve 25 percent in energy savings by 2016. It is expected to be funded primarily through the domestic private sector (more than 70 percent of the total cost) and also envisions a small amount of technical assistance from international partners (roughly one percent of the project cost) (Trabacchi et al. 2012).<sup>7</sup> Notwithstanding the change in regime in January 2011, the new Tunisian government appears committed to continue supporting the widespread adoption of energy efficiency and renewable energy policies toward achieving their targets (Olz 2011).

### ROLE OF INTERNATIONAL SUPPORT

International support has been important in addressing barriers to the adoption of solar water heaters in Tunisia, especially in the residential market. In 1996, the World Bank, with \$7.4 million from GEF and the Belgian government, including \$0.7 million in technical assistance, supported a subsidy program for solar water heaters (World Bank 2004). The program successfully increased consumer awareness and confidence in SWH systems. However, it did not lead to sustained results because it failed to tackle some of the other barriers to the adoption of solar water heaters, including the problem of access to finance (Olz 2011). In 2002, the Mediterranean Renewable Energy Programme (MEDREC) was established as a partnership between the Italian Ministry of Environment and Territory, the Ministry for Industry and Energy of Tunisia, ANME and UNEP—with financial support from the Italian Ministry of Environment and Territory—to foster increased investment in the renewable energy sector in Algeria, Egypt, Libya, Morocco, and Tunisia. MEDREP's Finance Initiative supported the promotion and development of renewable energy projects and deployment of financing mechanisms in the region, as well as strengthening capacities and dissemination of information in the field of renewable energies.<sup>8,9</sup>

In 2005, the MATTM provided support of \$2.2 million for Prosol through UNEP and MEDREC, including \$1 million each for a subsidy on the capital costs of solar water heaters and a temporary interest rate subsidy, and \$0.2 million for readiness activities to address barriers to the adoption of the solar water heater market. Although the amount of public financial support for the program was only about 18 percent of the total investment, and international support for readiness activities made up less than 1 percent (Trabacchi et al. 2012), its impact has been significant. Awareness-raising campaigns have been important in informing consumers about the benefits of solar water heaters and spurring demand. An accreditation scheme for suppliers and installers and solar water heater certification has helped ensure quality, reducing technology failure rates to approximately one percent and thereby boosting consumer and financial institutions' confidence in the technology (Trabacchi et al. 2012). Capacity building for financial institutions proved pivotal in the engagement of the local commercial banks in unlocking the local credit market (GIZ 2009).

## OBSERVATIONS AND INSIGHTS

- As the Tunisian experience prior to Prosol highlights, financial incentives (in the form of a capital cost subsidy) alone are not sufficient to create a viable market on a long-term basis. Readiness activities, including targeted awareness and communication campaigns, capacity-building activities, and rigorous enforcement of quality standards, are fundamental to success. Access to finance was also a critical barrier that needed to be addressed.
- The careful allocation of risks among key actors can help attract banks and other private investors. In the Prosol case, the state utility STEG assumed default risks by taking on the role of debt repayment enforcer and loan guarantor, and passed these risks on to consumers by withholding services in the event of nonpayment. The near-zero default rate of Prosol loans has made the initiative profitable for banks despite the lower interest rate charged, and more affordable for households, improving the prospects for the mechanism to be replicated.
- Commitment from the Tunisian government was key to the success of Prosol. Efforts to support solar water heater investments, including policies to promote solar water heaters through a capital cost subsidy, was important in allowing the sector to be competitive in a market distorted by fossil fuel subsidies.
- Strengthening the confidence and capacity of banks to lend to residential consumers was instrumental in the success of Prosol. Capacity-building activities targeting financial institutions created awareness of the market potential and proved pivotal in the engagement of the local commercial banks in unlocking the local credit market for solar water heaters.
- By actively involving all the sector stakeholders and conducting strong awareness campaigns, Prosol raised consumer awareness of the benefits of solar water heater systems and ensured that banks were key promoters of the sector.

Table 1 | **Milestones in the Development of Tunisia’s Solar Water Heaters**

YEAR	MILESTONE
1984	The government of Tunisia developed the first solar thermal energy strategy.
1985	The government established the National Energy Management Agency (ANME).
1990	The government passed the Energy Conservation Law.
1993	The government passed the Investment Incentives Code, which created financial incentives for investments in energy conservation.
1996	The World Bank supported ANME with a project to subsidize the capital cost of solar water heaters to commercial (public and private) institutions and the residential sector, and promote awareness of solar water heaters.
2005	Programme Solaire (Prosol) was launched with support from the Italian Ministry of the Environment for the Protection of Land and Sea (MATTM) and the technical support of UNEP. Prosol aimed to revive the market for SWHs in the residential sector by engaging local financial institutions to provide credit lines to consumers.

YEAR	MILESTONE
2005	The government of Tunisia passed a law providing for a capital cost subsidy for solar water heaters installed in the residential sector and establishing a National Fund for Energy Conservation (FNME).
2007	A second phase of Prosol was launched with \$21.8 million from FNME and \$0.2 million from the MATTM.
2009	The government of Tunisia launched the \$2.2 billion Solar Plan 2010-2016, which aims to increase the share of renewable energy in total electricity production by 16 percent, and achieve 25 percent in energy savings by 2016.

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## ENDNOTES

1. Including the Energy Conservation Law in 1990 to promote the rational use of energy, and the Investment Incentives Code in 1993 to support investment in energy conservation and renewable energy.
2. Personal interviews and correspondence with in-country and international experts.
3. Personal communication with international expert.
4. As the Prosol Industry is still under design, the elements of the program may change.
5. Personal interview with in-country expert.
6. [http://namadatabase.org/index.php/Plan\\_Solaire\\_Tunisia\\_NAMA](http://namadatabase.org/index.php/Plan_Solaire_Tunisia_NAMA)
7. <http://www.pavingthewaymsp.eu/fileadmin/paving-the-way/Tunisa.pdf>
8. MEDREC website: [http://www.medrec.org/en/about\\_medrec.php](http://www.medrec.org/en/about_medrec.php)
9. UNEP: <http://www.unep.org/climatechange/finance/LoanProgrammes/MEDREP/tabid/29557/Default.aspx>

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