



# Decentralized solar systems applications in Lebanon: the perspective of UNDP

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UNDP – CEDRO PROJECT

HASSAN HARAJLI

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Project  
funded by the  
EUROPEAN UNION



# Outline

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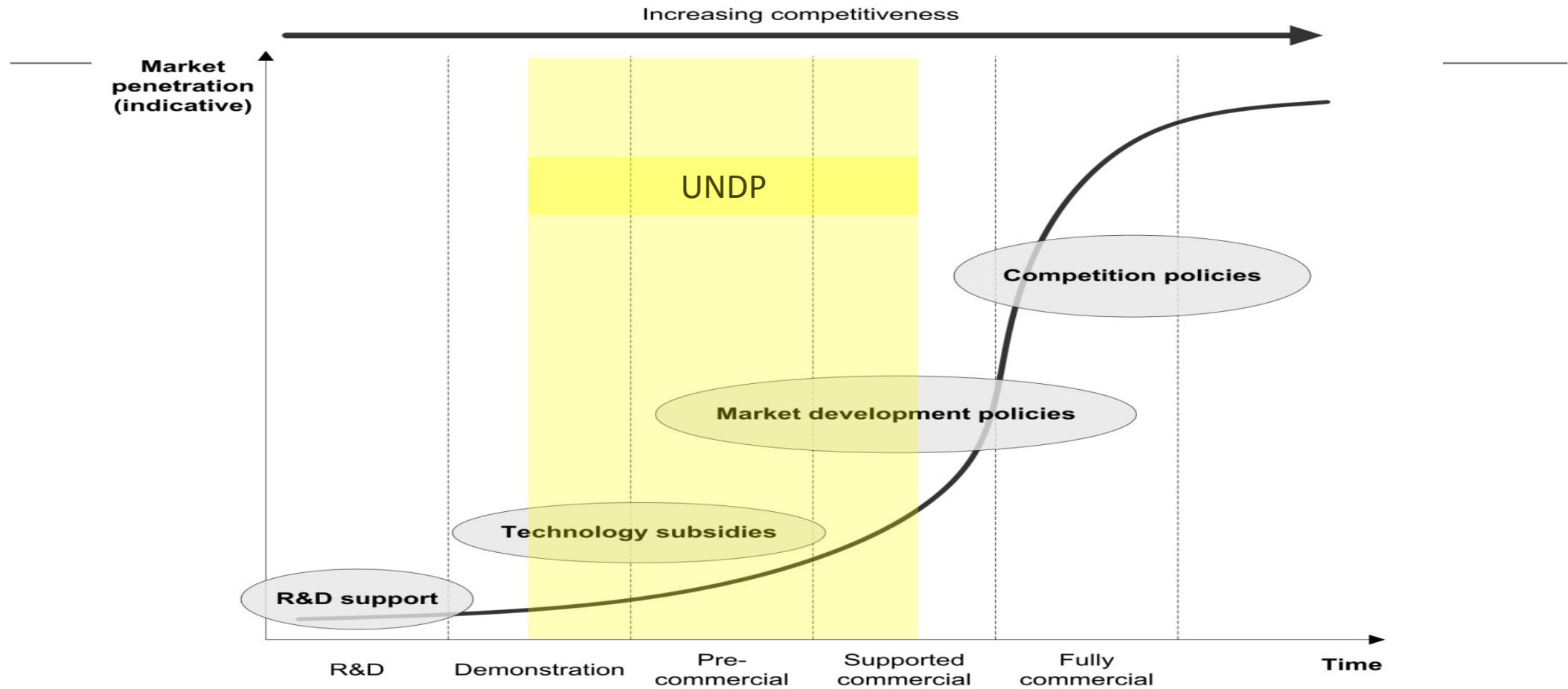
- UNDP: Past and Present
- The role of the UNDP
- Solar hot water
- Solar PV systems
- Future activities



# Overview of UNDP projects



# The role of the UNDP: Stirring the local market

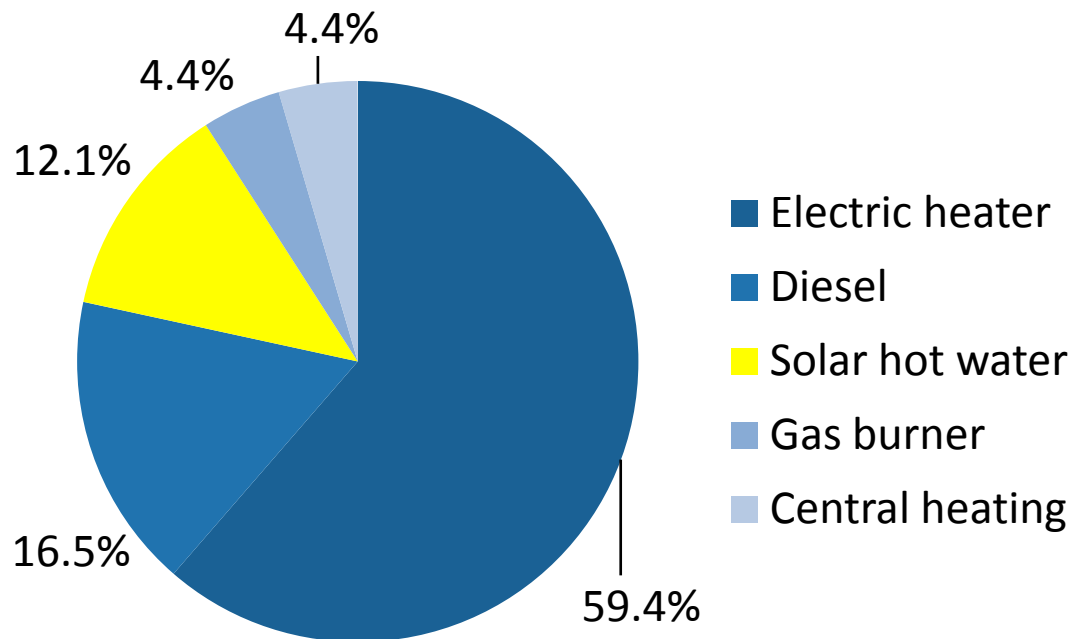


*The commercial maturity of new and renewable energy technologies relative to market penetration (Foxon et al. 2005)*

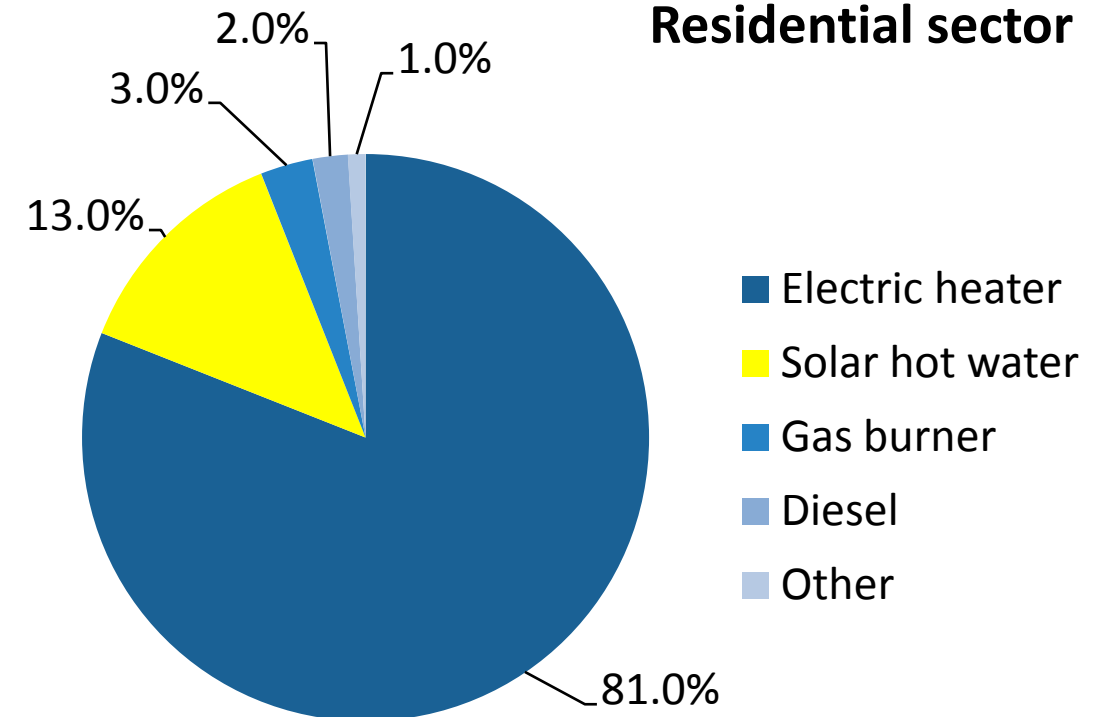
# Progress and Barriers

## Solar hot water (1)

### Commercial sector



### Residential sector



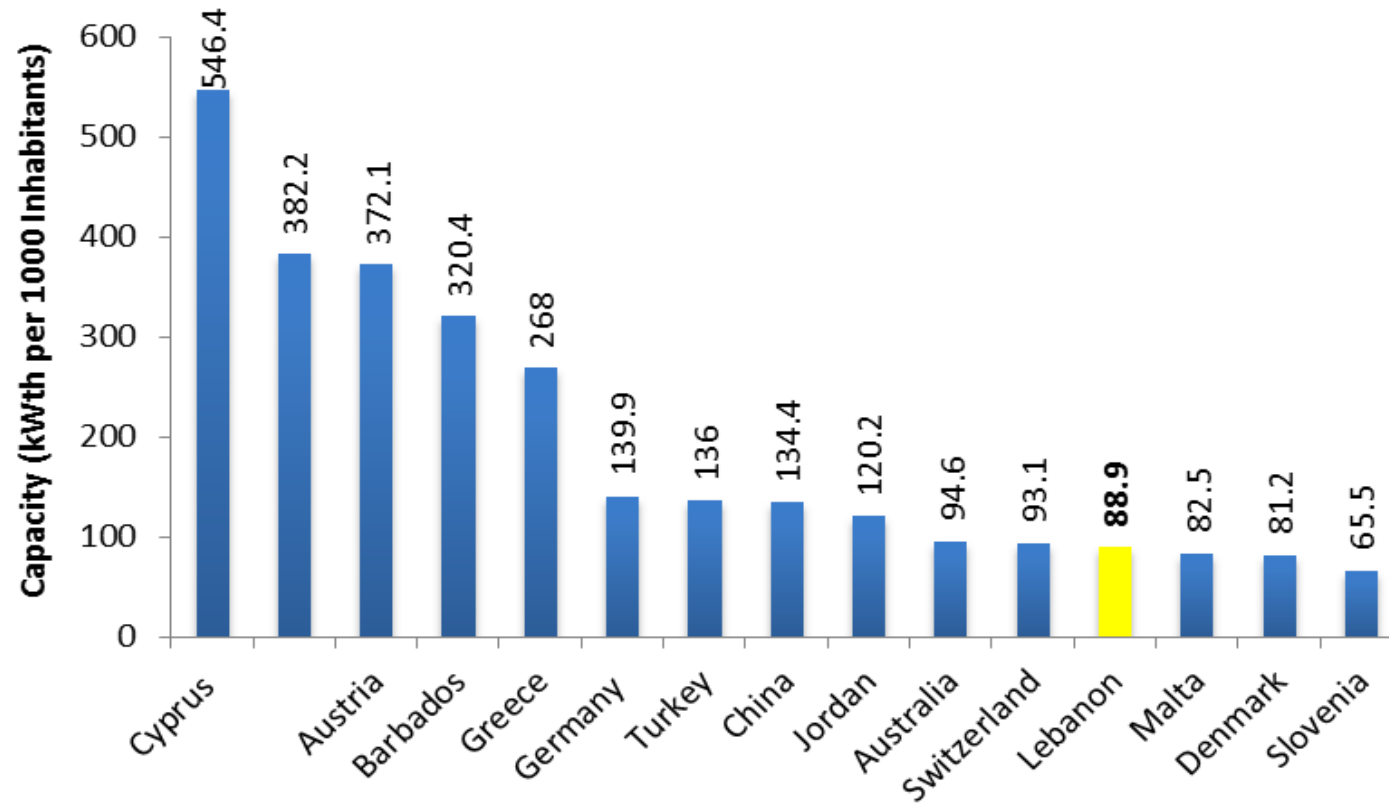
# Solar hot water (2)



Project funded by the EUROPEAN UNION



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Engineering Lebanon with Renewable Energy



Mauthner & Weiss, 2012. Solar Heat WorldWide; Solar Heating and Cooling Programme; IEA

# Electricity-led distributed systems; PV

Project	location	capacity	Project	location	capacity
1 Rajem Issa Public School	North Lebanon	1800 Wp	35 Ehmej Intermediate School	Mount Lebanon	1800 Wp
2 Mashta Hammoud Public School	North Lebanon	1800 Wp	36 Zouk Mosbeh Intermediate School	Mount Lebanon	1800 Wp
3 Kherbet Daoud Public School	North Lebanon	1800 Wp	37 Keyfoun Public School	Mount Lebanon	1800 Wp
4 El Tleile Public School	North Lebanon	1800 Wp	38 Kartaba Municipality	Mount Lebanon	1800 Wp
5 Hekr El Dahiri Public School	North Lebanon	1125 Wp	39 Selaata Public School	North Lebanon	1125 Wp
6 Ouyoun El Samak Public School	North Lebanon	1800 Wp	40 Jran Intermediate School	North Lebanon	1800 Wp
7 Kroum Arab Public School	North Lebanon	1125 Wp	41 Kfarhata Public School	North Lebanon	1800 Wp
8 Ain Yaacoub Mixed Public School	North Lebanon	1800 Wp	42 Al Fadel Public School	North Lebanon	1800 Wp
9 Habshit Public School	North Lebanon	1125 Wp	43 Jwar El Hashish Public School	North Lebanon	1125 Wp
10 Meniara Public School	North Lebanon	1800 Wp	44 Al Nour Public School - Mina	North Lebanon	1125 Wp
11 El-Hakoor Mixed Public School	North Lebanon	1125 Wp	45 Gebrayel Municipality	North Lebanon	1125 Wp
12 Baalbeck First Elementary School	Bekaa	1125 Wp	46 Ijdabra Municipality	North Lebanon	1125 Wp
13 Chmestar Community Centre	Bekaa	1800 Wp	47 Ibreen Municipality	North Lebanon	1800 Wp
14 Hosh El Harime Intermediate School	Bekaa	1800 Wp	48 Khraybet El Metn Public School	Mount Lebanon	1800 Wp
15 Jeb Jennine Municipality and Library	Bekaa	1800 Wp	49 Mayfouq Municipality	Mount Lebanon	1800 Wp
16 Mdoukha Public School	Bekaa	1800 Wp	50 Akoura Municipality	Mount Lebanon	1800 Wp
17 Hosh El -Oumara Community Centre	Bekaa	1800 Wp	51 Al Marej Secondary School	Bekaa	1800 Wp
18 Aana Intermediate Public School	Bekaa	1800 Wp	52 Manara Secondary School	Bekaa	1800 Wp
19 Tell Zounoub Intermediate Public School	Bekaa	1125 Wp	53 Hermel Municipality	Bekaa	1125 Wp
20 Ayteet Public School	South	1125 Wp	54 Ain Deleb Public School	South	1800 Wp
21 Kherbet Selem First Public School	South	1800 Wp	55 Ayta El Shaeb Municipality	South	1125 Wp
22 Kfarkela First Public School	South	1125 Wp	56 Bouday Municipality	Bekaa	1125 Wp
23 Kfarshouba Intermediate Public School	Nabatieh	1800 Wp	57 Nabatieh- Al Fariha Public School	Nabatieh	1800 Wp
24 Houla Municipality	South	1125 Wp	58 Al Ein Municipality	Bekaa	1125 Wp
25 Ain Ebel Municipality	South	1125 Wp	59 Al Taybeh Municipality	Nabatieh	1125 Wp
26 Hammana Community Center	Mount Lebanon	1800 Wp	60 Kabrikha Public School	Nabatieh	1125 Wp
27 Shiah Secondary Public School	Beirut	1800 Wp	61 Kantara Municipality	Nabatieh	1125 Wp
28 Kherbet Kanafar Municipality	Bekaa	1800 Wp	62 Dekweneh Technical School	Mount Lebanon	2700 Wp
29 El Qaa Intermediate School	Bekaa	1800 Wp	63 Hamet Municipality	North Lebanon	1125 Wp
30 Baalback Barracks	Bekaa	1125 Wp	64 Kfarhay Municipality	North Lebanon	1125 Wp
31 El Kalaa Community Center	Mount Lebanon	2025 Wp	65 Lebanese University- Tripoli Campus	North Lebanon	2700 Wp
32 Shouf Technical School	Mount Lebanon	1125 Wp	66 Yahchouch Municipality	Mount Lebanon	2700 Wp
33 Khelwet Public School	Mount Lebanon	1125 Wp	67 Lebanese University- Roumieh Campus	Mount Lebanon	1125 Wp
34 Kfour Public School	Nabatieh	2025 Wp	68 Sultaniyeh Municipality	Nabatieh	1125 Wp
			69 Yanta Public School	Bekaa	2700 Wp
			70 Zahleh Public School	Bekaa	2700 Wp

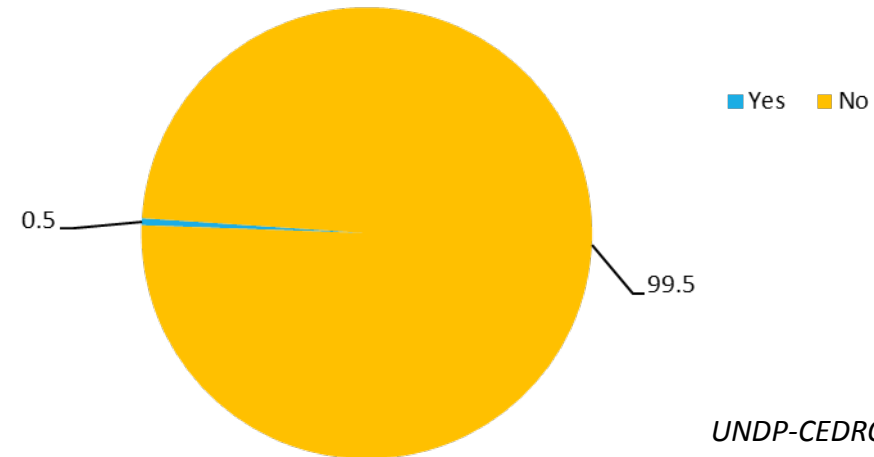
# Electricity-led distributed systems (2)

Percentage (%) with renewable energy installed  
Residential Sector



UNDP-CEDRO Survey 2013

Percentage of institutions with RE system already installed  
Commercial Sector



UNDP-CEDRO Survey 2013

RESIDENTIAL		COMMERCIAL (ALSO INDUSTRIAL)	
PROS	CONS	PROS	CONS
Architecture set and disseminated	Batteries required, curtailed production	Architecture being set & to be disseminated	Very few projects existing
High potential to displace genset	High upfront capital	Saves on diesel, curtailed production	Can't displace diesel (esp. in bigger institutions)



# Electricity-led distributed systems (3)



*Lost generation due to blackouts; varies across sectors and within sectors*

*Generator efficiency cannot be jeopardized with RE installation (30-40% min)*

Site	Annual PV Generation (kWh)	Annual PV Theoretical (kWh)	Performance ratio (%)
Anaa (1.125 kWp)	1117.5	1396.5	80.0
Kherbet Daoud (1.8 kWp)	1255.0	1845.8	68.0
Kherbet Selim (1.8 kWp)	1167.6	2078.4	56.2
Miniara (1.8 kWp)	1548.5	1969.3	78.6

*Example of CEDRO projects in small schools*



# UNDP Future activities in the solar field 2014-2016

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- Seven commercial-sized solar PV systems; hybrid diesel-PV; 120-140 kWp each (EU - CEDRO)
- 10-15 sites (50-100 kWp each); GEF Solar PV project
- PV lighting kits; 1000 houses in host communities in the Bekaa and Akkar
- Solar street lighting; 250 poles in host communities in the Akkar region



# Pending UNDP publications and studies related to solar energy

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- Net-Metering Update study (LCEC/CEDRO)
- Commercial Solar Hot Water study (CEDRO)
- Willingness to pay for RE study (CEDRO)
- Solar street Lighting Study (CEDRO)
- Distributed Generation Study (CEDRO)
- GEF financial instrument assessment Study (GEF-Solar PV project)





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**Please contact CEDRO at:**

T/F: +961-1-981944

E: [info@cedro-undp.org](mailto:info@cedro-undp.org)

[www.cedro-undp.org](http://www.cedro-undp.org)

Beirut, Maarad Street,

Building 287B, 1<sup>st</sup> floor

# Thank you



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