

# TRANSFORMATIONAL CHANGE IN CONCENTRATED SOLAR POWER

*This case study looks at the Climate Investment Funds' (CIF) experiences in supporting concentrated solar power (CSP) projects in Chile, Morocco, and South Africa, with the intention of drawing lessons to enhance the transformational impacts of future investments in the clean energy transition. The case study explores how the role of CSP in tackling climate change has evolved since 2008 and how investments in CSP have played out in three relevant markets through the lens of transformational change.*

## BACKGROUND

The role of CSP technology has evolved since the mid-2000s when it was first seen as a way to simply add renewables to the grid in places with high levels of solar irradiation. Currently, the main value of CSP lies in its ability to store energy to meet demand during evening and night-time peaks.

Since 2009, CIF, through the Clean Technology Fund (CTF), and in collaboration with national governments and multilateral development banks (MDBs), have provided concessional financing to CSP projects in Morocco and South Africa, as well as contributed to a CSP project in Chile.

CTF-supported CSP projects represent approximately one gigawatt (GW) of CSP deployments, out of a total of six GW deployed globally. CTF investments in CSP have yielded a wealth of experience that utilities and government institutions around the world can draw on to procure and support the deployment of CSP and other renewable energies.

## CTF INVESTMENTS IN CSP

CIF has been a leading supporter of the demonstration and scaling of CSP technology across several countries. Between 2009 and 2012, CSP was identified by local governments, MDBs, and CTF as a technology with transformational potential due to five main reasons:

- Replication potential in hundreds of GWs across countries with high levels of strong uninterrupted sunlight;
- Ability to provide continuous clean energy to displace polluting generation technologies, such as coal;
- Local employment and business creation potential with high levels of local component manufacturing;



## QUICK FACTS

### PUBLICATIONS SERIES

Transformational Change Case Study

### PUBLICATION DATE

August 2021

### RELEVANT CIF PROGRAM

Clean Technology Fund (CTF)

### RELEVANT COUNTRIES

Chile, Morocco and South Africa

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- Potential for countries, particularly in the Middle East and North Africa (MENA), to export energy to Europe; and
- Reduction of fuel imports to bolster energy security and lower fiscal pressure.

Despite these advantages, CSP, at the time of project approval, faced significant barriers, including high costs compared to fossil alternatives, high costs of financing, a lack of track record, and knowledge gaps. Providing targeted technical assistance and deploying concessional finance from CTF and MDBs contributed to the understanding and unlocking of the potential of CSP with thermal energy storage (TES).

## CSP INVESTMENTS IN CONTEXT: THE CASES OF MOROCCO, SOUTH AFRICA, AND CHILE

CIF's overarching goal is to advance transformational change towards low-carbon and climate-resilient development. Overall, CTF-supported CSP projects in these countries have shown signals of change across the five main dimensions of CIF's [Transformational Change framework](#): relevance, systemic change, speed, scaling, and adaptive sustainability. **The projects demonstrated a high degree of relevance during conception, design, and implementation.** To enhance their relevance and thus facilitate transformational impact, CIF's CSP projects were anchored within national energy planning processes and carried out after extensive consultations with key stakeholders and regional MDBs.

**A range of signals of systematic change were manifested in the results of CIF'S CSP projects** that contributed to substantial shifts in technologies, institutions, and behaviors, as well as helped address key barriers to change, such as the lack of a track record. The deployment of around one GW of CSP capacity in Morocco and South Africa demonstrated the value of the technology and supported reductions in the cost of CSP. This is exemplified by the difference between the feed-in-tariffs (REFIT) of around USD 0.40 per kilowatt-hour (kWh) granted to early CSP projects in Spain in 2008 as compared to the USD 0.07 cents per kWh granted recently to the Dubai Water and Electricity Authority's (DEWA) 950 CSP-PV and Morocco's Noor Midelt I projects. Additional signals of systemic change included strengthened institutional capacities required to carry out renewable energy (RE) procurement in both countries.

**The projects have also made a significant contribution to scaling CSP**, which is evidenced by the projects mobilizing approximately USD 7 billion in investments and contributing to multiple rounds of procurement within each target country. In addition, **CIF's investments in CSP have been able to help accelerate the deployment of CSP at scale**, particularly in Morocco and South Africa. In Morocco, the rate of deployment of CSP has been noteworthy, with capacity growing from zero to more than 530 megawatts (MW) between 2009 and 2019. However, the pace of global deployment remains relatively slow: many CSP projects have faced practical delays in political approval and implementation.

**The projects also contributed to signals of adaptive learning and responses at the intersection of environmental, social, and economic sustainability.** The emergence of CSP projects in China and the United Arab Emirates (UAE), as well as recent announcements of CSP projects in Spain, testify to the climate benefits and economic sustainability of CSP. Moreover, past social and/or racial injustices are being addressed in South Africa and Morocco through the provision of preferential employment opportunities to disadvantaged groups. By increasing local economic development, as well as decarbonizing power generation and overall energy systems, CSP projects have enhanced the prospects of adaptive sustainability.

## THE WAY FORWARD FOR CSP

Over the last decade, CIF's CSP projects have achieved success in improving the operational efficiencies of large-scale CSP plants, effectively meeting dispatchable requirements at the national level and demonstrating significant reductions in generation cost benchmarks in global terms. Nonetheless, CSP remains a relatively niche technology, progressing at a slower pace than most RE technologies, even though there are signs that wider adoption may be under way. Still, sustainability remains uncertain, as technology markets evolve.

Going forward, it would be important for climate funds, such as CIF, to support the early backing of a portfolio of potentially high-impact technologies and business models by ensuring that the most effective and cost-efficient can mature. Efforts to mobilize around a technology need to be supported at scale. Learning from the deployment of CSP with TES can still play a role in the transformation of energy systems in countries with relevant environmental, social, technological, and economic contexts.