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Green ways for a good earth!

Assessing the Development of **Floating Solar PV** in India

2025

Credits

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About Vasudha Foundation

Vasudha Foundation is a non-profit organisation set up in 2010. We believe in the conservation of Vasudha, which in Sanskrit means the Earth, the giver of wealth, with the objective of promoting sustainable consumption of its bounties. Our mission is to promote environment-friendly, socially just and sustainable models of energy by focusing on renewable energy and energy-efficient technologies as well as sustainable lifestyle solutions.

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1. Introduction

Globally, the transition to clean energy is accelerating to reduce emissions and mitigate the effects of climate change. At the forefront of this effort is the expansion of renewable energy (RE), which is helping to decarbonise the electricity grid. India has witnessed a significant transformation in its energy sector, with installed RE capacity increasing from 58 GW in 2010-11 to 228.2 GW as of March 2025, making it the fourth-largest in the world in terms of installed RE capacity[1]. This expansion aligns with the country's ambitious RE target of achieving 500 GW from non-fossil sources by 2030[2].

While solar and wind energy dominate India's RE landscape, accounting for 61 percent and 29 percent of the total installed RE capacity (excluding large hydropower plants), respectively, floating solar PV (FPV) is an emerging technology with the potential to contribute 196.2 GW[3] of renewable energy capacity to the country's power grid. At the state level, as shown in Figure 1, Madhya Pradesh possesses the highest FPV potential of 40.1 GW, followed by Maharashtra (32.1 GW) and Karnataka (18.2 GW). FPV holds significant promise for India's energy future, especially in regions with limited land availability. Although the technology is in its nascent stages, regions with large water reservoirs and favourable climatic conditions are ideal locations for floating solar expansion.

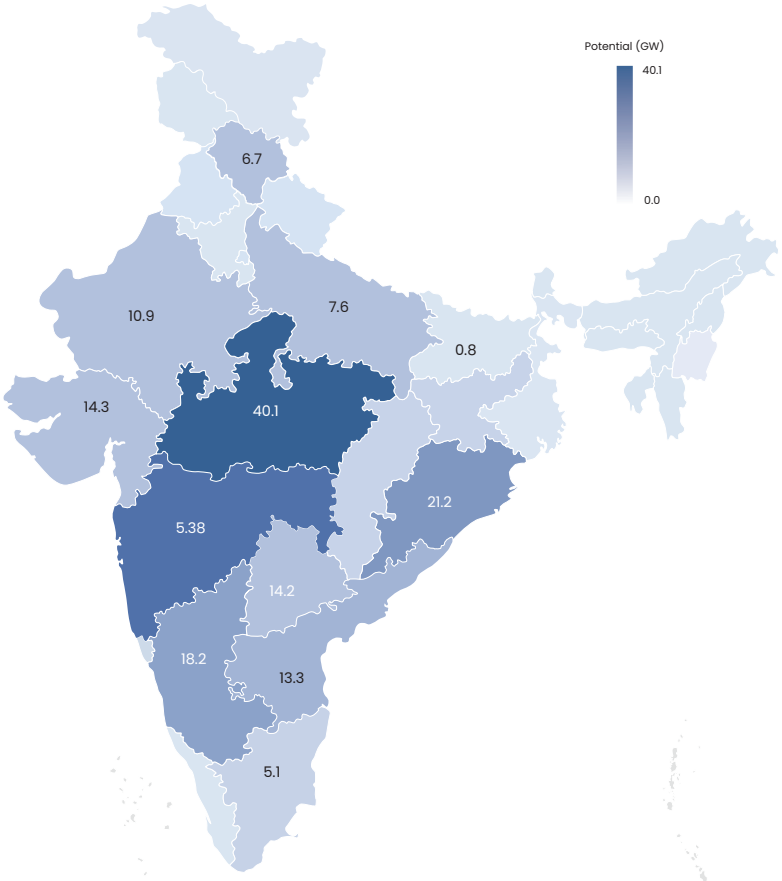


Figure 1: State-wise floating solar capacity[4]

1 https://iced.niti.gov.in/
2 https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2073038
3 https://beta.cstep.in/staaidev/assets/manual/FPV.pdf
4 https://beta.cstep.in/staaidev/assets/manual/FPV.pdf

FPV has gained traction in recent years, with around 1489 MW[5] capacity currently deployed. While the current installed floating solar capacity remains relatively low compared to other solar sub-typologies, projects such as Madhya Pradesh's Omkareshwar Floating Solar Park with a capacity of 600 MW[6] underscores the growing interest in this technology. The project also showcases favourable pricing, with the lowest tariff discovered to date under the tariff bid of INR 3.21 per kWh[7]. Specifically, this tariff is applicable to the allocated capacity of 100 MW, awarded to AMP Green Energy Private Limited, under Phase-1 of 300 MW allocation out of the total 600 MW Omkareshwar Floating Solar project.

With increasing investments and policy support, floating solar is expected to play a crucial role in diversifying India's solar energy portfolio and enhancing energy generation efficiency in regions with abundant water bodies. This report presents a study of the current policy framework for FPV projects and how the ecosystem can be made more conducive to such developments.

2. Policy Landscape

As the urgency to combat climate change grows, effective policy and regulatory frameworks play a crucial role in accelerating the shift to cleaner energy. Clear guidelines, incentives, and stable regulations help de-risk investments, attracting both domestic and global players to drive RE and progress towards net-zero emissions. 84 percent of global utility-scale renewable capacity growth from 2024 to 2030 is expected to be policy-driven[8]. Well-defined policies not only set long-term targets but also create investor confidence by ensuring clarity in implementation.

India's RE landscape has evolved through continuous policy adaptation at both the national and state levels. These reforms are now expanding to address accelerated RE capacity addition, ensuring smoother land acquisition and grid connectivity, leading to higher RE penetration and positioning the country to achieve its target of 50 percent cumulative electric power capacity from non-fossil fuel sources by 2030[9]. This section highlights key national-level policy and regulatory initiatives on floating solar, followed by a comparative analysis of policies across ten Indian states[10] that together represent over 72 percent of the country's renewable energy potential.

2.1 National Level Initiatives

Although India is keen on venturing into floating PV for harnessing solar energy, the country is yet to introduce any national-level policy initiatives specifically aimed at promoting FPV projects.

2.2 State Policy Provisions

FPV systems are increasingly being acknowledged by states as a promising technology for clean energy expansion, especially in land-constrained or water-rich geographies. However, despite this recognition, most state policies stop short of setting clear targets or designing robust support frameworks for large-scale FPV deployment.

Andhra Pradesh, Karnataka, Odisha, Rajasthan, Telangana, and Uttar Pradesh explicitly mention floating solar in their policies, identifying reservoirs, canals, and water bodies as viable sites. However, only a few states, such as Odisha, with its pre-feasibility assessment citing 5,000 MW of FPV potential, have conducted or published comprehensive state-wide potential assessments. This lack of quantified data poses a barrier to strategic deployment and investor confidence.

Most states, including Andhra Pradesh, Gujarat, and Telangana, provide basic facilitation, such as site identification in coordination with water resource departments. However, dedicated capital incentives, standard operating procedures (SOPs) for float manufacturers, or streamlined clearance mechanisms tailored to FPV are largely missing. Odisha is a notable exception, offering nominal lease arrangements and promising partial funding for innovative water-based solar projects.

Further, support for R&D and pilot demonstrations remains patchy. While Andhra Pradesh and Karnataka encourage academic collaboration and exploratory projects under pilot/R&D umbrellas, few states have institutionalised frameworks to systematically test float technologies, anchoring systems, or long-term O&M performance under Indian conditions.

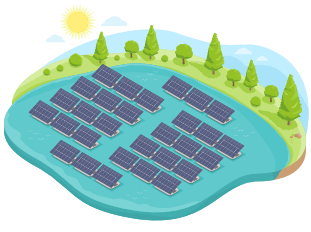
In essence, while FPV is well-positioned in state policy discussions, its transition from a niche idea to a mainstream solution will require more concrete enablers - target setting, cost incentives, standardisation, and water-use integration protocols to fully unlock its potential as part of India's diversified solar portfolio. An analysis of the state-level policies regarding the support provided to FPV projects is presented in Table 1.

8 https://iea.blob.core.windows.net/assets/17033b62-07a5-4144-8dd0-651cdb6caa24/Renewables2024.pdf
9 https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2073038#:~:text=The%20solar%20photovoltaic%20(PV)%20sector,the%20end%20of%20the%20year.
10 States Studies- Andhra Pradesh, Gujarat, Rajasthan, Odisha, Tamil Nadu, Karnataka, Telangana, Uttar Pradesh, Maharashtra, Madhya Pradesh

Table 1: Floating solar state level policy analysis

Category	Floating Solar				
Parameter	Mention of floating solar in policy	MW targets / Deployment plans for FPV	Potential assessment	Support to developers (site identification, capital incentives, SOP for float manufacturer)	Demonstration support / R&D / testing facilities
Andhra Pradesh	Yes, FPV is explicitly mentioned as a priority area. The policy identifies water bodies such as reservoirs and canals as potential sites	No specific MW targets are outlined exclusively for FPV, but the policy includes FPV under its broader solar development strategy	The policy proposes identification of water bodies for FPV, but no detailed potential assessment or quantified study is cited	The policy offers support through site identification in collaboration with relevant departments. No mention of capital incentives or SOP for float manufacturers	The policy encourages pilot projects and collaboration with academic/research institutions for testing and viability studies, especially for FPV
Gujarat	Explicitly mentioned and encouraged	No specific target, but policy encourages deployment on canals/reservoirs	Not detailed, but site identification to be done in coordination with Water Resources Department	Royalty terms clarified; procurement allowed by DISCOMs under competitive bidding. Sites to be identified by concerned water authorities	Not mentioned
Karnataka	Yes, FPV is explicitly included among the eligible project types	No separate MW target for FPV has been defined	No specific reference to a state-wide potential assessment for FPV is mentioned	FPV is eligible for support under the general RE framework, but no special SOPs or capital incentive packages exclusive to FPV are mentioned	FPV is listed among technologies that may receive state support for pilot projects and R&D under the "New Initiatives/Pilot Projects/R&D" section
Madhya Pradesh	Yes, mentioned as part of decentralised and utility-scale solar options, especially in reservoirs and water bodies	No separate target specified for FPV within the broader solar target	Not explicitly discussed; however, mention of water bodies indicates intent to utilise available reservoir space	No dedicated SOPs or capital incentives for float manufacturing; general support is applicable under solar developer facilitation mechanisms	No mention of demonstration or R&D facilities specifically for FPV
Maharashtra	Short-term submerged land in reservoirs, seepage ponds, and small irrigation ponds in Maharashtra will be used for a feasibility study for setting up unconventional energy projects	N/A	N/A	N/A	N/A

Category	Floating Solar				
Parameter	Mention of floating solar in policy	MW targets / Deployment plans for FPV	Potential assessment	Support to developers (site identification, capital incentives, SOP for float manufacturer)	Demonstration support / R&D / testing facilities
Odisha	N/A	N/A	Pre-feasibility report details 5000 MW FPV potential	1. All potential sites except private water bodies shall be considered as identified projects 2. The Department of Water Resources shall allow the development of FPV projects on the water bodies under its administrative control on payment of a nominal annual lease rent/ upfront payment	1. Partial of full funding for such innovative projects / R&D initiatives on a case-to-case basis 2. Approve allocation of land and/ or water bodies at concessional lease
Rajasthan	Yes, FPV projects are encouraged, especially on reservoirs, canals, and water bodies	No separate MW target for FPV; part of the cumulative RE target	No explicit potential assessment study for FPV mentioned	RRECL to facilitate site identification for projects over reservoirs and water bodies; no dedicated SOP for float manufacturing or explicit capital incentives detailed	No specific mention of dedicated R&D or pilot testing facilities for FPV
Tamil Nadu	N/A	N/A	N/A	N/A	N/A
Telangana	Yes, FPV projects have a separate section in the policy	No standalone FPV target is specified. However, the state aims to target solar capacity of 7889 MW by FY30 and 26374 MW by FY35	N/A	The nodal agency, in collaboration with the Irrigation Dept. will identify potential reservoirs/other water bodies for setting up FPV projects	N/A
Uttar Pradesh	Yes, mentioned as a focus area under innovative solar applications	No specific MW target mentioned for FPV	Not provided in the policy	No specific mention of site identification, float SOPs, or capital incentives for FPV	Not mentioned



3. FPV Value Chain

To understand the challenges that persist in floating solar project implementation and to find targeted solutions, it is necessary to take stock of the various stakeholders participating in the ecosystem. As depicted below in Figure 2, we observe that there are three primary categories of stakeholders that influence the floating solar project implementation.

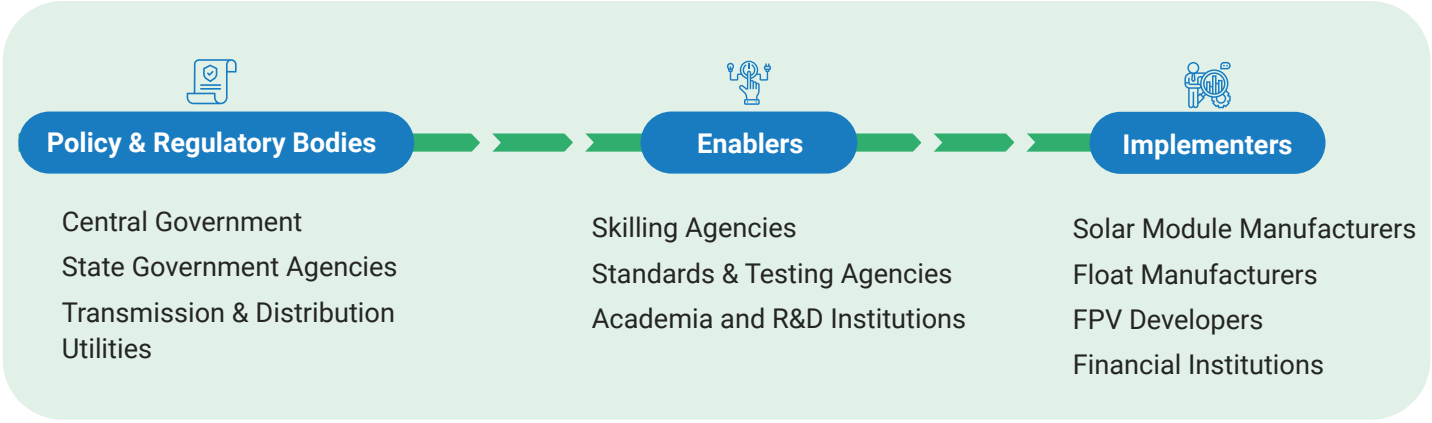


Figure 2: Stakeholder groups in the floating solar ecosystem

3.1 Policy and Regulatory Bodies

As detailed in the previous section, a stable policy and regulatory framework is of utmost importance for de-risking floating solar projects, attracting greater investment into the sector, ensuring smooth project implementation, and thereby leading to faster adoption within the country's energy mix. There are three major stakeholder groups concerning policy and regulatory affairs:

» **Central Government Bodies**
Central government bodies play an important role in formulating the policy and regulatory frameworks in India. The Centre is expected to issue guidelines, launch subsidies, and release mandates, nationwide, for the states to develop their own floating solar policies. Schemes and policies, as discussed in the previous section, are created by the central bodies keeping the interest of the project developers and consumers in mind. Central authorities such as Solar Energy Corporation of India (SECI) and other Renewable Energy Implementation Agencies (REIAs) are also responsible for project tendering and implementation on a national scale. The central government agencies consulted for this study include the Ministry of New and Renewable Energy (MNRE) and the Solar Energy Corporation of India (SECI).

» **State Government Agencies**
State agencies oversee the entire project lifecycle, from tendering to commissioning. Their responsibilities include assessing potential, forecasting future demand, formulating state-specific floating solar policies, allocating water bodies for projects, introducing state-level subsidies, and managing project tendering and implementation in alignment with projected demand. The state government agencies considered for this study are listed in Annexure 1.

» **Transmission and Distribution Utilities**

Transmission and distribution utilities play a crucial role in shaping the RE landscape of the country. As custodians of the electricity grid, they are responsible for the efficiently evacuating power from floating solar plants and providing off-taker guarantees for such projects. Reliable power generation from floating solar installations helps Distribution Companies (DISCOMs) reduce their dependence on fossil fuels, enabling them to procure green energy for supply to both domestic and commercial consumers. Annexure 2 captures the list of state-level stakeholders considered for our study.

3.2 Enablers

While policy and regulatory bodies create an enabling environment for the development of floating solar projects, the continued growth of the sector also depends on a skilled workforce, ongoing research into new technologies, and robust testing processes to ensure the quality and reliability of power. Organisations offering skilling programs and those engaged in research and development of emerging floating solar technologies have been identified, as shown in Annexure 3.

3.3 Implementers

While policy-making organisations and enablers lay the foundation for the future of RE in India and work towards developing a skilled workforce, the role of implementers is crucial in turning the country's RE potential into reality through the deployment of floating solar projects. For the requirements of this study, participation was sought from institutions listed in Annexure 4.

4. Stakeholder Insights

To gain a holistic view of the floating solar ecosystem in India, in-person consultations were conducted with various stakeholders of the FPV ecosystem. These stakeholders represented various facets of the ecosystem, as described in the previous section. These interactions played a crucial role in helping us identify the existing gaps and determine potential solutions to address them, thereby enabling the accelerated deployment of FPV projects.

4.1 Overview of Key Challenges Identified

- **Lack of Detailed Potential Assessment for FPV at the State Level:**
  A significant challenge in deploying FPV systems is the absence of detailed potential assessments at the state level. Currently, there is no comprehensive mapping of individual water bodies, coupled with crucial assessments such as water ownership, soil bathymetry analysis, and other environmental factors in some states. This lack of detailed data makes it difficult to identify suitable locations for FPV projects, delaying the scaling and effective implementation of floating solar technology across the country.
- **No Specific Targets for FPV in State RE Policies:**
  While many states have set ambitious RE goals, FPV is often overlooked, with no dedicated targets or incentives. This lack of policy emphasis results in limited investment, slow adoption, and an unclear pathway for large-scale FPV deployment.
- **High LCOE Makes FPV Less Competitive than Utility-Scale Solar:**
  The Levelised Cost of Electricity (LCOE) for FPV remains significantly higher due to expensive floats, anchoring systems, and maintenance of water-based infrastructure. Without financial incentives, subsidies, or economies of scale, FPV remains confined to isolated pilot projects with no viable pathway for large-scale adoption.
- **Lack of Quality and Testing Standards for Floats:**
  The absence of standardised float manufacturing and testing protocols results in variability of product quality, durability, and performance. Establishing IS-certified guidelines and mandatory testing parameters is essential to ensure long-term reliability and create a level playing field for manufacturers.
- **Limited Pilot Projects to Demonstrate Technology Feasibility:**
  With only a handful of pilot projects, there is insufficient real-world data to validate the long-term benefits, challenges, and best practices for FPV deployment. More government-supported demonstration projects are needed to validate the technology performance, attract investors, and build confidence among developers.
- **Local Community Consent for FPV:**
  A significant challenge in FPV projects is obtaining local community consent, especially in areas where water bodies are utilised by the community for fishing, bathing, or irrigation. Many residents fear that FPV systems will negatively impact the water body, either by restricting access or by causing environmental harm. These perceptions often leads to resistance, making it difficult for developers to proceed with projects in such regions.

- **Lack of Clarity on SOPs and Regulatory Procedures for FPV Projects:**
  Developers face significant challenges due to the absence of clear SOPs for setting up temporary manufacturing units near reservoirs. Additionally, there is a lack of clarity regarding project approval processes, including the necessary environmental clearances and compliance with various regulations such as water codes, fishing laws, and agricultural use laws. This uncertainty causes delays and creates procedural confusion, hindering smooth implementation.
- **Building the Capacity of State Officials on New Typologies:**
  Another challenge in the deployment of innovative renewable energy solutions, such as FPV and other emerging technologies, is the limited capacity of state officials to understand and manage new project typologies. Many state officials are not fully equipped with the knowledge or expertise required to handle novel systems and technologies, leading to delays in inclusion in policies, approvals, implementation, and compliance. This skill gap leads to delays in policy inclusion, approvals and implementation, thereby creating bottlenecks and slowing progress.

4.2 Recommended Solutions

- States should initiate pilot projects to assess the technical and economic feasibility of FPV systems, helping to identify cost-effective solutions and optimise system designs for larger-scale adoption.
- Setting specific, measurable policy targets for FPV capacity, supported by Viability Gap Funding (VGF), will encourage investments, reduce risks for developers, and facilitate market growth.
- A comprehensive strategy should be developed to assess potential across states, taking into account the characteristics of water bodies. Local administrations must raise awareness about the benefits of FPV, including improved water quality and clean energy generation, while engaging communities in transparent consultations to build trust and support.
- Relevant authorities should create a detailed set of SOPs for developers, covering all aspects of FPV project setup, including environmental and regulatory compliance. A single-window clearance system should be introduced to simplify and expedite approvals, ensuring developers meet all necessary legal requirements.
- To reduce import dependency, policy targets should be introduced to promote local float manufacturing, supported by VGF and simplified approval processes. This will address raw material quality issues and enhance the self-sufficiency of the FPV sector.
- Explore innovative tendering strategies at the state level, such as aggregating multiple water bodies at the district or multi-district level for FPV projects. This approach will demonstrate economies of scale, making projects more attractive to developers and investors. It will also incentivise the establishment of temporary float manufacturing units within the district, facilitating local production and reducing logistical costs and accelerating project implementation.

Annexure-1

State Authorities Stakeholder Mapping

State	State Nodal Agency
Andhra Pradesh	New & Renewable Energy Development Corporation of Andhra Pradesh Ltd
Gujarat	Gujarat Energy Development Agency
Karnataka	Karnataka Renewable Energy Development Limited
Madhya Pradesh	Madhya Pradesh Urja Vikas Nigam Ltd
Maharashtra	Maharashtra Energy Development Agency
Odisha	Orissa Renewable Energy Development Agency
Rajasthan	Rajasthan Renewable Energy Corporation Limited
Tamil Nadu	Tamil Nadu Green Energy Corporation Ltd
Telangana	Telangana Renewable Energy Development Corporation
Uttar Pradesh	Uttar Pradesh New and Renewable Energy Development Agency

Annexure-2

State Distribution Utility & State Transmission Utility Stakeholder Mapping

State Distribution Utility & State Transmission Utility Stakeholder Mapping		
State	Organisation Type	Organisation Name
Andhra Pradesh	State Distribution Utility	Andhra Pradesh Southern Power Distribution Company Limited
	State Transmission Utility	Transmission Corporation of Andhra Pradesh
Gujarat	State Distribution Utility	Gujarat Urja Vikas Nigam Limited
	State Transmission Utility	Gujarat Energy Transmission Corporation Limited
Karnataka	State Distribution Utility	Chamundeshwari Electricity Supply Corporation Limited
	State Transmission Utility	Karnataka Power Transmission Corporation Limited
Madhya Pradesh	State Distribution Utility	MP Paschim Kshetra Vidyut Vitran Company Limited
	State Transmission Utility	Madhya Pradesh Power Transmission Company Ltd
	State Distribution Utility	Maharashtra State Electricity Distribution Company Ltd.
	State Transmission Utility	Maharashtra State Electricity Transmission Company Limited

State Distribution Utility & State Transmission Utility Stakeholder Mapping		
State	Organisation Type	Organisation Name
Odisha	State Distribution Utility	TP Central Odisha Distribution Limited
	State Transmission Utility	Odisha Power Transmission Corporation Limited
Rajasthan	State Distribution Utility	Jaipur Vidyut Vitran Nigam Limited
	State Transmission Utility	Rajasthan Rajya Vidyut Prasaran Nigam Limited
Tamil Nadu	State Distribution Utility	Tamil Nadu Power Distribution Corporation Ltd
	State Transmission Utility	Tamil Nadu Transmission Corporation Limited
Telangana	State Distribution Utility	Telangana State Northern Power Distribution Company Ltd
	State Transmission Utility	Transmission Corporation of Telangana Limited
Uttar Pradesh	State Distribution Utility	Noida Power Company Limited
	State Transmission Utility	UP Power Transmission Corporation Limited

Annexure-3

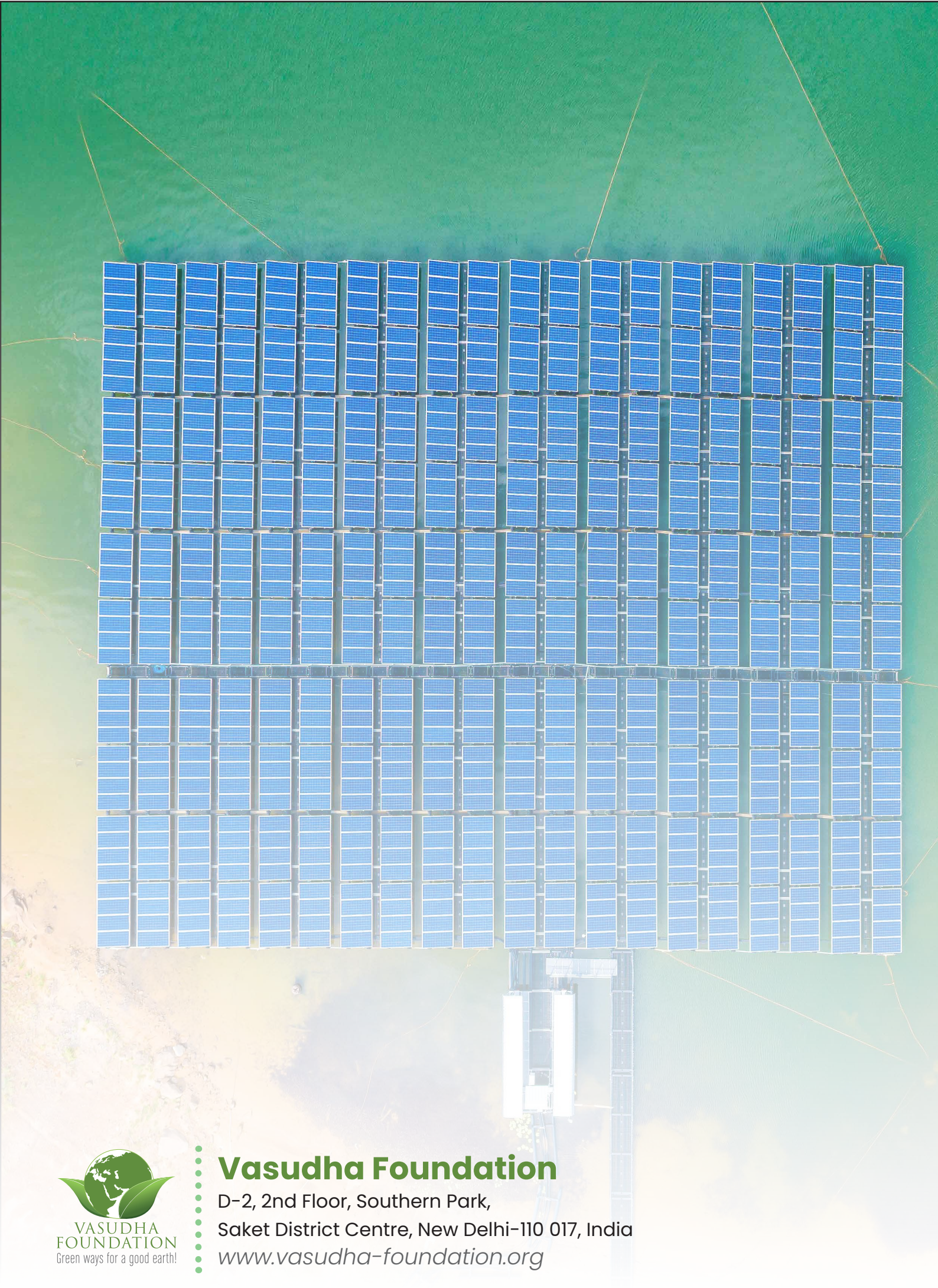
Floating Solar Enablers Stakeholder Mapping

Floating Solar Enablers Stakeholder Mapping	
Skilling Agencies	Skill Council on Green Jobs
	National Institute of Solar Energy
Standards & Testing Agencies	TUV SUD
	Bureau Veritas
Research and Development & Academia	National Institute of Solar Energy

Annexure-4

Floating Solar Implementers Stakeholder Mapping

RTPV Developer	
Float Manufacturer	Ceil & Terre
	Floatex Solar
FPV Developer	Ceil & Terre
Financial Institutions	Asian Development Bank (ADB)
	World Bank



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