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नवीकरणीय ऊर्जा मंत्रालय
MINISTRY OF
**NEW AND
RENEWABLE ENERGY**
सत्यमेव जयते

NISE
National Institute of Solar Energy

SOLAR PV POTENTIAL OF INDIA

FLOATING SOLAR

June 2026

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Floating Solar

June 2026

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“India’s journey toward a sustainable future lies in harnessing every available resource responsibly, innovatively and at scale”

-Inspired by vision of Shri Narendra Modi, Prime Minister of India

MESSAGE

प्रल्हाद जोशी
PRALHAD JOSHI
ಪ್ರಲ್ಹಾದ ಜೋಶಿ

उपभोक्ता मामले, खाद्य और सार्वजनिक वितरण तथा
नवीन और नवीकरणीय ऊर्जा मंत्री
भारत सरकार
MINISTER OF CONSUMER AFFAIRS
FOOD & PUBLIC DISTRIBUTION AND
MINISTER OF NEW & RENEWABLE ENERGY
GOVERNMENT OF INDIA

Message

I extend my heartfelt congratulations to the National Institute of Solar Energy on the release of the Report on Solar PV Potential of India (Floating Solar). India's energy future will be powered not only by solar parks on land but also by the immense potential of our water bodies.

As India's solar journey accelerates, optimising land use has become increasingly important. Floating Solar Photovoltaics offer a strategic pathway to expand clean energy generation while conserving valuable land resources.

This report provides a comprehensive assessment of India's floating solar potential and estimates an untapped capacity of approximately 102.18 GWp across reservoirs, irrigation tanks, hydropower lakes, and other water bodies. I urge states, developers, financial institutions, and researchers to utilise this report as a foundation for investment, planning, and policymaking.

I commend the dedicated efforts of NISE's scientists and experts and am confident that this report will serve as a valuable resource for all stakeholders working towards an energy-secure and sustainable India.

(Pralhad Joshi)

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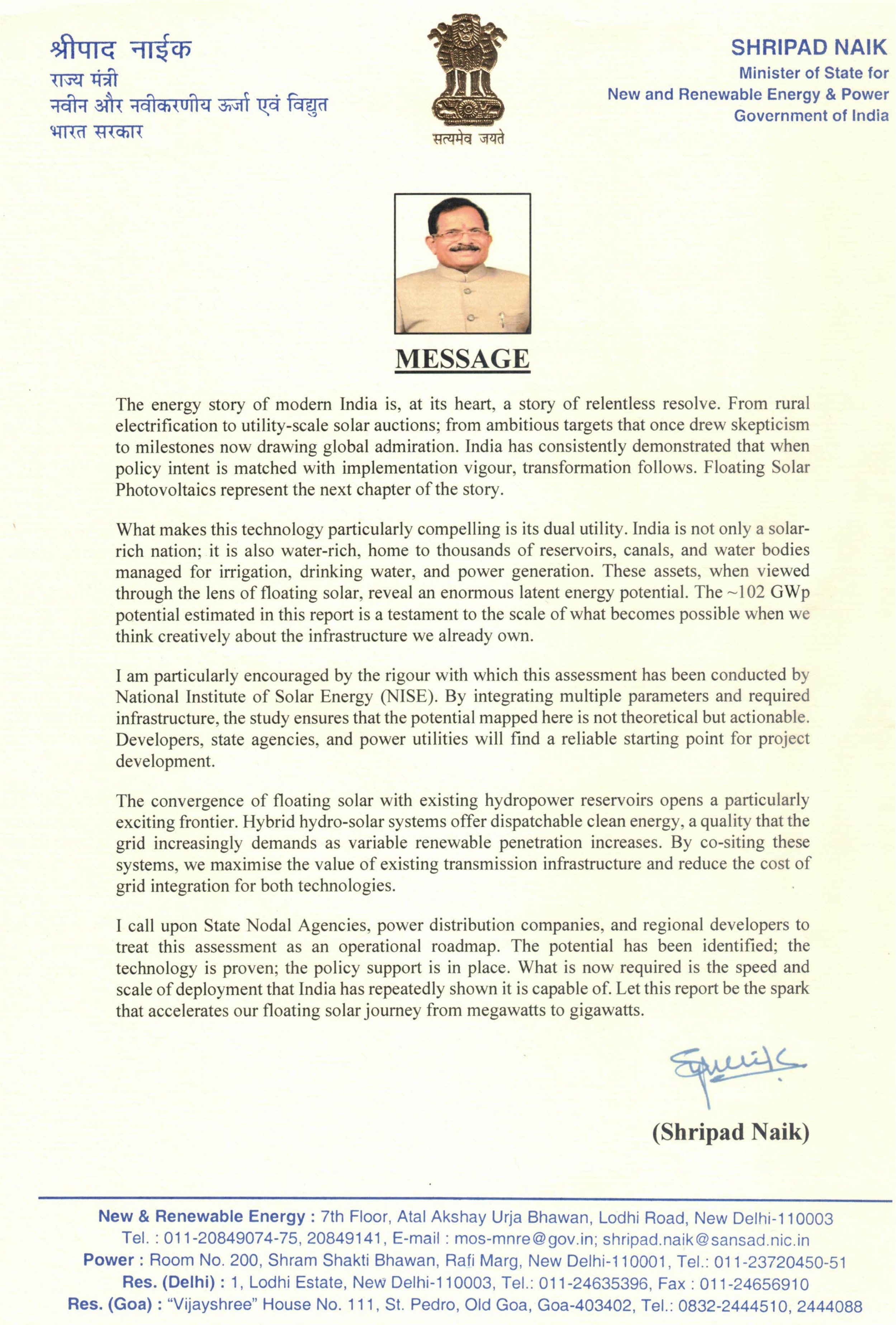
MESSAGE



श्रीपाद नाईक
राज्य मंत्री
नवीन और नवीकरणीय ऊर्जा एवं विद्युत
भारत सरकार

SHRIPAD NAIK
Minister of State for
New and Renewable Energy & Power
Government of India

MESSAGE

The energy story of modern India is, at its heart, a story of relentless resolve. From rural electrification to utility-scale solar auctions; from ambitious targets that once drew skepticism to milestones now drawing global admiration. India has consistently demonstrated that when policy intent is matched with implementation vigour, transformation follows. Floating Solar Photovoltaics represent the next chapter of the story.

What makes this technology particularly compelling is its dual utility. India is not only a solar-rich nation; it is also water-rich, home to thousands of reservoirs, canals, and water bodies managed for irrigation, drinking water, and power generation. These assets, when viewed through the lens of floating solar, reveal an enormous latent energy potential. The ~102 GWp potential estimated in this report is a testament to the scale of what becomes possible when we think creatively about the infrastructure we already own.

I am particularly encouraged by the rigour with which this assessment has been conducted by National Institute of Solar Energy (NISE). By integrating multiple parameters and required infrastructure, the study ensures that the potential mapped here is not theoretical but actionable. Developers, state agencies, and power utilities will find a reliable starting point for project development.

The convergence of floating solar with existing hydropower reservoirs opens a particularly exciting frontier. Hybrid hydro-solar systems offer dispatchable clean energy, a quality that the grid increasingly demands as variable renewable penetration increases. By co-siting these systems, we maximise the value of existing transmission infrastructure and reduce the cost of grid integration for both technologies.

I call upon State Nodal Agencies, power distribution companies, and regional developers to treat this assessment as an operational roadmap. The potential has been identified; the technology is proven; the policy support is in place. What is now required is the speed and scale of deployment that India has repeatedly shown it is capable of. Let this report be the spark that accelerates our floating solar journey from megawatts to gigawatts.

(Shripad Naik)

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MESSAGE

सत्यमेव जयते

संतोष सारंगी, भा.प्र.से.
सचिव

Santosh Sarangi, IAS
Secretary

भारत सरकार
नवीन और नवीकरणीय ऊर्जा मंत्रालय
Government of India
Ministry of New and Renewable Energy

Message

India's renewable energy transition is distinguished not only by its ambition but by the institutional seriousness with which it has been approached. Sound policymaking demands accurate, disaggregated, and spatially explicit data and it is precisely the need that the present assessment of India's Floating Solar Photovoltaic potential seeks to address. The Ministry of New and Renewable Energy commends the National Institute of Solar Energy for producing what is perhaps the most methodologically rigorous national-level FSPV potential study to date.

The policy significance of this report extends well beyond the headline figure of ~102 GWp. Equally important is the state-wise disaggregation of potential, which enables planners to prioritise interventions, match capacity with demand centres, and align FSPV deployment with state-level renewable purchase obligations and energy transition plans. Identification of technically feasible sites filtered through criteria of irradiance, water depth, seasonal availability, and infrastructure proximity transforms this from an academic exercise into a planning instrument.

The Ministry has been engaged in strengthening the enabling environment for floating solar through multiple policy levers. Regulatory clarity around waterbody usage rights, environmental clearances, and grid connectivity remains a priority area, and the findings of this report will directly inform those ongoing policy conversations.

It is also worth underscoring the role of inter-ministerial convergence in realising India's FSPV potential. Reservoirs managed by the Ministry of Jal Shakti, canals under State Irrigation Departments, and hydropower lakes under the jurisdiction of power utilities all represent potential FSPV deployment sites. Effective coordination across these institutional domains will be essential for translating potential into capacity addition.

I encourage all stakeholders state energy departments, water resources authorities, project developers, and multilateral financiers to engage with the data presented in this report and to participate actively in the collaborative framework the Ministry is building to accelerate FSPV deployment. Together, we can ensure that India's water bodies become productive partners in our clean energy future.

(Santosh Sarangi)

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MESSAGE

सत्यमेव जयते
मयंक तिवारी
MAYANK TEWARI

अपर सचिव
भारत सरकार
नवीन और नवीकरणीय ऊर्जा मंत्रालय
ADDITIONAL SECRETARY
GOVERNMENT OF INDIA
MINISTRY OF NEW AND RENEWABLE ENERGY

Message

A potential assessment acquires its full value not at the moment of publication, but at the moment it shapes a decision, a tender design, a site selection, an investment commitment, or a state-level programme target. It is with that understanding that I welcome the release of this comprehensive assessment of India's Floating Solar Photovoltaic potential. The ~102 GWp identified across India's inland water bodies is not a number to be cited and shelved; it is a call to structured action, and this report provides the foundation for exactly that.

One of the enduring challenges in renewable energy programme management is the distance between identified potential and bankable projects. That distance is typically bridged through pre-feasibility studies, site-specific environmental assessments, grid evacuation planning, and waterbody access negotiations, a sequence that demands institutional coordination, technical capacity, and sustained follow-through. What this report does, with unusual care, is compress the first stage of that journey. By filtering sites through parameters of irradiance, depth, seasonal water availability, and infrastructure proximity, it delivers not a raw opportunity map but a pre-screened project inventory.

For the FSPV sector to scale at the pace India's clean energy targets require, developer and investor confidence must keep pace with policy intent. That confidence rests on three pillars: data quality, regulatory clarity, and programme predictability. This report strengthens the first pillar substantially. The granularity of the waterbody-wise annexure, disaggregated to the level of individual reservoirs with feasible area and potential estimates, enables developers to undertake credible pre-feasibility assessments without commissioning fresh primary surveys.

The Ministry is committed to working with states to assess deployment readiness alongside potential, ensuring that FSPV programmes are designed around sites where development can proceed with speed and certainty. The state-wise distribution in this reportwith Maharashtra, Madhya Pradesh, Karnataka, Odisha, Telangana, and Gujarat leading provides a natural starting point for that prioritisation exercise.

I commend NISE for the rigour and ambition of this study. The work of turning 102 GWp of mapped potential into gigawatts of operating capacity is now a shared institutional responsibility, one that MNRE takes seriously and will pursue with the focused determination that India's clean energy transition demands.

Shri Mayank Tewari
Additional Secretary, Ministry of New and Renewable Energy

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MESSAGE

सत्यमेव जयते

जे.वी.एन. सुब्रमणयम, भा.प्र.से.
J.V.N. SUBRAMANYAM, IAS

संयुक्त सचिव
भारत सरकार
नवीन और नवीकरणीय ऊर्जा मंत्रालय
JOINT SECRETARY
GOVERNMENT OF INDIA
MINISTRY OF NEW AND RENEWABLE ENERGY

Message

The transition from potential assessment to on-ground deployment is the central challenge in any technology scaling effort, and floating solar is no exception. This report addresses that challenge with uncommon precision: by establishing a transparent, reproducible, and data-rich methodology for mapping India's Floating Solar Photovoltaic potential, it provides the kind of granular, site-level information that developers, financiers, and state agencies need to move from expression of interest to financial closure.

The methodology adopted in this study deserves specific recognition. The integration of multiple geospatial datasets Global Surface Water layers for seasonality, bathymetric data for depth assessment, GHI radiation maps, and infrastructure proximity buffers for roads and substations ensures that the potential identified is technically realistic. The deliberate exclusion of shallow and seasonally variable water bodies, and the application of a 20% surface utilisation constraint, reflects an approach that privileges implementability over optimism.

At the operational level, several aspects of this assessment will directly inform programme design. The state-wise breakdown of FSPV potential with Maharashtra, Madhya Pradesh, Karnataka, Odisha, Telangana, and Gujarat emerging as the leading contributors provides the basis for prioritising state-specific FSPV programmes, tailoring tariff structures, and deploying central financial assistance where it will have the greatest leverage. The annexure mapping waterbody-wise potential further enables project-level feasibility studies without additional primary data collection.

From a programme management standpoint, the findings also point to important areas for institutional focus: waterbody access rights and clearance frameworks, evacuation infrastructure readiness, and environmental monitoring protocols. Addressing these systematically in partnership with state governments and relevant central agencies will be critical to converting this mapped potential into sanctioned and commissioned capacity.

I am confident that this report will serve as a durable reference for stakeholders across the FSPV ecosystem. Its data will feed into programme planning cycles, request for proposal designs, and state-level energy strategies. I encourage all implementing agencies to build on this foundation and to maintain the momentum that India's floating solar sector has achieved over recent years.

Shri J.V.N. Subramanyam

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FOREWORD

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डॉ. मोहम्मद रिहान / Dr. Mohammad Rihan
महानिदेशक / Director General

Foreword

The publication of this report marks a significant advance in India's solar resource characterisation programme. As the premier research institute for solar energy under the Ministry of New and Renewable Energy, the National Institute of Solar Energy (NISE) has undertaken this comprehensive potential assessment of Floating Solar Photovoltaics (FSPV) with the twin objectives of scientific rigour and policy relevance. The result is a study that, for the first time at the national scale, translates India's inland water body geography into a technically qualified FSPV opportunity landscape.

The assessment adopts a multi-parameter geospatial framework that goes considerably beyond surface area calculations. Five critical evaluation dimension's structure the analysis: solar irradiance (Global Horizontal Irradiance derived from validated datasets), infrastructure proximity (road and substation networks within 10 km buffers), waterbody suitability (minimum area thresholds to exclude marginal sites), water availability (seasonal permanence using Global Surface Water data), and bathymetry (depth compatibility with standard FSPV mooring and anchoring systems). Each parameter is operationalised through clearly defined, technically justified thresholds. This layered approach ensures that the assessed potential is not a theoretical upper bound but a technically feasible, deployment-ready estimate.

The key finding of the study is FSPV potential of 102.18 GWp under a conservative 20% surface utilisation constraint. It reflects the true scale of India's untapped water surface resource. This constraint of 20% itself is deliberate: it preserves ecological functions, accommodates co-uses such as fisheries and irrigation, and aligns with global best practices for sustainable FSPV deployment. The potential is unevenly distributed, with Maharashtra, Madhya Pradesh, Karnataka, Odisha, Telangana, and Gujarat collectively accounting for the preponderance of technically feasible capacity, a geographic pattern driven by the density, size, and year-round water availability of large irrigation and multipurpose reservoirs in these states.

From a technical design standpoint, the report also addresses the performance characteristics that distinguish FSPV from Ground-Mounted PV. Water-surface cooling effects on module operating temperatures, while site-specific and dependent on meteorological conditions, offer measurable energy yield benefits at several assessed locations. The energy yield assessment chapter, utilising Typical Meteorological Year data and validated simulation tools, provides both system designers and project developers with a quantitative basis for performance projections. Losses associated with water reflection, soiling from aquatic environments, and wave-induced micro-vibrations are accounted for, lending credibility to the energy generation estimates.

NISE acknowledges the contributions of State Nodal Agencies, technical experts, and data partners whose inputs enriched the ground-level validation of this study. Scientific progress of this nature is inherently collaborative, and this report is no exception. I am confident that the methodological framework developed here will serve as a replicable template for future assessments; as India's renewable energy programme continues to evolve in ambition.

Dr. Mohammad Rihan
Director General, National Institute of Solar Energy

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ACKNOWLEDGEMENT

The assessment of India's floating solar photovoltaic potential was undertaken with significant institutional and technical support from multiple organisations. Comprehensive guidance, and oversight were provided by leadership and technical support of Solar Energy Research and Analytics Lab, National Institute of Solar Energy, which enabled the adoption of advanced geospatial techniques, waterbody mapping approaches, and refined analytical methodologies essential for achieving the objectives of this study. The administrative and coordination support of Mr Dhananjay Pandey in printing and publishing the report was instrumental.

The Ministry of New and Renewable Energy (MNRE) extended continuous support throughout the assessment process and facilitated consultations with key stakeholders and domain experts. These interactions ensured that diverse technical perspectives, policy considerations, and implementation challenges were effectively incorporated into the analysis.

Satellite-derived information on waterbody extent, seasonal variability, and spatial characteristics formed a critical foundation for identifying suitable sites and estimating floating solar potential across the country.

Valuable contributions were also received from State Nodal Agencies (SNAs) and relevant state departments. Their inputs on reservoir usage, regulatory considerations, infrastructure availability, and site-specific constraints provided important ground-level insights, enhancing the reliability and practical relevance of the assessment across diverse regions.

This collaborative effort has resulted in a scientifically robust and policy-relevant assessment that supports India's transition toward an energy-secure and sustainable future through the deployment of floating solar technologies.

EXECUTIVE SUMMARY

The rapid scale-up of solar photovoltaic (PV) capacity is central to achieving global and national climate and energy transition goals. While ground-mounted solar PV has expanded significantly, land availability has emerged as a critical constraint, particularly in densely populated regions and areas with competing land uses. Floating Solar Photovoltaics (FSPV), which involve deploying solar PV systems on water bodies and ponds, offer a strategic solution to this challenge by enabling large-scale solar deployment without exerting additional pressure on land resources.

This report presents a comprehensive, data-driven assessment of India's FSPV potential. Globally, FSPV has evolved into a rapidly expanding segment of the solar sector, led by countries such as China, India, South Korea, and Japan, with cumulative installed capacity reaching ~9.6 GW by 2024 and annual additions of ~1–1.2 GW. Growth has been concentrated in the Asia-Pacific region due to land constraints, supportive policies, and the availability of water bodies. International experience indicates that even partial utilisation of reservoir surfaces can unlock significant solar potential, alongside co-benefits such as reduced evaporation and enhanced PV efficiency due to water-induced cooling. In this context, the report highlights the need for a systematic assessment framework to enable evidence-based policymaking, infrastructure planning, and investment decisions, while ensuring environmental sustainability, grid integration, and long-term operational reliability.

The study adopts a rigorous geospatial methodology, integrating high-quality national and global datasets to evaluate floating solar feasibility across India. The key parameters considered include the presence and size of water bodies, year-round water availability (seasonality), bathymetry (water depth), solar irradiance (Global Horizontal Irradiance), and proximity to supporting infrastructure such as road networks and transmission substations. The report adopted clearly defined thresholds of the parameters, such as minimum waterbody area, depth range, GHI levels, and infrastructure proximity, to ensure that identified sites are realistic and implementable at scale.

Based on this integrated assessment, the study estimated India's total floating solar potential at approximately 102.18 GWp, with a constraint of using only 20% of the reservoir area. The potential is unevenly distributed across states, with particularly high concentrations in Maharashtra, Madhya Pradesh, Karnataka, Odisha, Telangana, and Gujarat, reflecting the availability of large, technically suitable reservoirs and inland water bodies. Smaller and shallow water bodies have been deliberately excluded to avoid overestimation and to align the results with practical deployment considerations.

Overall, the findings highlight floating solar as a significant and scalable complement to ground-mounted PV in India's renewable energy portfolio. By optimising the use of underutilised water surfaces, floating solar can help overcome land constraints, enhance energy security, support water conservation objectives, and accelerate progress toward national renewable energy and climate targets. The assessment provides a strong analytical foundation for policymakers, developers, and financial institutions to prioritise sites, design targeted interventions, and mainstream floating solar within India's long-term clean energy strategy.

CONTENT

1. Introduction

Annexure

NOMENCLATURE

ABBREVIATION

SPV	Solar Photovoltaic
FSPV	Floating Solar Photovoltaics
GMPV	Ground-Mounted Photovoltaics
APAC	Asia-Pacific
O&M	Operation and Maintenance
MEA	Middle East and Africa
GRanD	Global Reservoir and Dam Database
BIPV	Building-Integrated Photovoltaics
HDPE	High-Density Polyethene
UV	Ultraviolet
POA	Plane of Array
WMS	Weather Monitoring Stations
EYA	Energy Yield Assessment
SAM	System Advisor Model
TMY	Typical Meteorological Year
MW_P	Megawatt Peak
GSW	Global Surface Water
GHI	Global Horizontal Irradiance
CAPEX	Capital and Operational Expenditures
OPEX	Operating Expenses
RESCO	Renewable Energy Service Company
LCOE	Levelized Cost of Electricity

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INTRODUCTION

INTRODUCTION

1.1 Background

The rapid expansion of solar photovoltaic (SPV) technology has played a central role in the global transition toward low-carbon energy systems. Worldwide adoption has been propelled by falling module prices, improved efficiencies, and strong policy commitments to decarbonization. Despite these advances, one persistent challenge is the availability of suitable land for large-scale solar deployment, particularly in densely populated regions or areas with competing land uses such as agriculture, urbanisation, and ecological conservation[1]. Even though utility-scale PV requires comparatively less land than many conventional energy sources, the issue of land availability remains a major barrier in many countries.

To address this constraint, alternative strategies have emerged. Among them, floating solar photovoltaic (FSPV), the installation of PV systems on water surfaces, has gained significant attention globally. FSPV offers the dual advantages of bypassing land-use conflicts and leveraging vast, underutilised water bodies, such as reservoirs, ponds, quarry lakes, hydropower dams, and irrigation tanks. As a result, FSPV is increasingly viewed as a strategic complement to Ground-Mounted Photovoltaics (GMPV), especially in countries facing land scarcity but possessing substantial inland or man-made water resources[2].

1.2 Rise of Floating Solar PV

The increasing interest in FSPV stems from a confluence of technological, environmental, and policy-driven factors. Initially deployed on calm, artificial water bodies such as irrigation ponds and quarry lakes, the technology has expanded into larger reservoirs, hydropower lakes, and protected nearshore marine zones[3]. The World Bank and SERIS (2019) highlighted the vast economic potential of FSPV, estimating that even partial use of existing man-made reservoirs could support several terawatts of solar capacity globally. The typical layout of the FSPV system is shown in Figure 1.

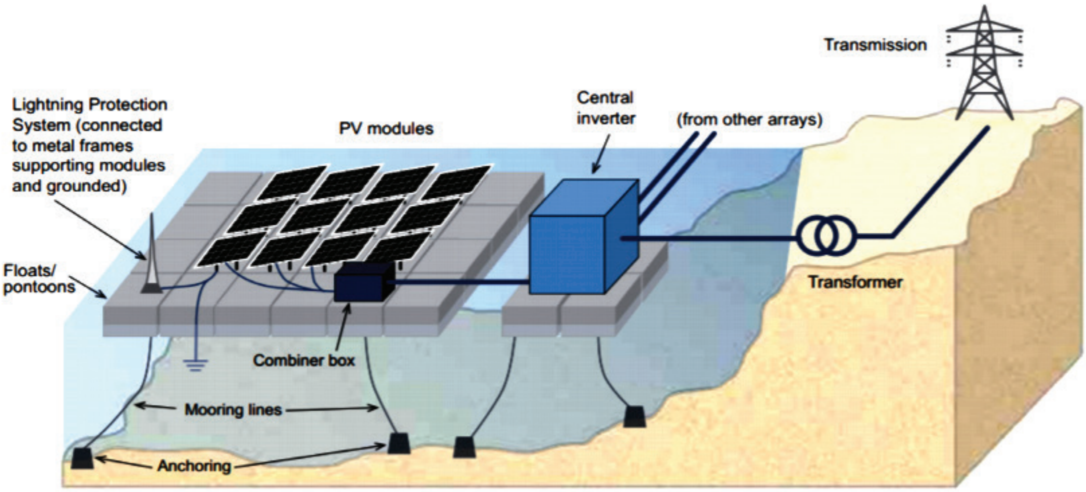

Figure 1. Typical schematic of FSPV plant [4]

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[1] IEA PVPS Task 13. (2025). Floating PV power plants: A review of energy yield, reliability, and maintenance (Report IEA-PVPS T13-31:2025). International Energy Agency.

[2] World Bank Group & SERIS. (2019). Where sun meets water: Floating solar market report. World Bank.https://worldbank.org/

[3] IEA PVPS Task 13. (2025). Floating PV power plants: A review of energy yield, reliability, and maintenance (Report IEA-PVPS T13-31:2025). International Energy Agency.

[4] Gamarra, C., & Ronk, J. (2019). Floating solar: an emerging opportunity at the energy-water nexus. Texas Water Journal, 10(1), 32-45.

Key factors Driving the rise of FSPV:

- Land-use advantages: FSPV uses water surfaces that typically have low competing demands. This reduces land acquisition challenges and minimises social conflicts compared to large GMPV installations[5].
- Enhanced Energy Performance: Water bodies provide a cooling effect on PV modules, which can reduce operating temperatures and potentially increase energy yield. Although modelling remains an area of active research, various field studies report measurable gains[6].
- Synergy with Hydropower: FSPV can be co-located with hydropower reservoirs, allowing shared infrastructure (access roads, substations) and enabling hybrid generation strategies. This synergy enhances overall grid stability and can improve capacity factors[7].
- Environmental co-benefits and constraints: FSPV arrays can reduce evaporation in arid regions, a benefit documented in field studies on irrigation reservoirs. However, the environmental impacts of shading, water temperature changes, and aquatic ecosystems remain site-specific, and evidence is still evolving. Reviews note significant knowledge gaps and call for systematic monitoring[8].
- Rapid Market Growth and Policy Momentum: Countries like China, the Netherlands, Singapore, and South Korea have established dedicated guidelines, while global entities such as DNV and IEC are developing standards for floats, mooring, electrical safety, and system performance[9]. This standardisation effort is improving investor confidence and supporting utility-scale deployments.

Despite the rapid growth, FSPV still faces challenges related to system reliability, wave-induced stress, environmental uncertainties, and a lack of long-term performance datasets. IEA-PVPS (2025) underscore the need for better modelling frameworks, standardised O&M practices, and robust degradation assessments.

1.3 Global Floating Solar PV

FSPV technology has transitioned from a niche concept to a meaningful segment of the solar industry over the past decade. Across more than 500 completed projects worldwide, the overwhelming majority, over 90%, are concentrated in Asia, underscoring the region's accelerated adoption of FSPV for utility-scale generation[10]. The Asia-Pacific (APAC) region remains the clear market leader. While APAC leads to adoption, Europe has steadily gained market share. This is particularly evident in countries such as the Netherlands and France, which utilise quarry lakes, sand pits, and artificial water bodies to expand solar generation in space-constrained regions. Europe's FSPV installations grew from barely 10 MW in 2017 to nearly 270 MW by 2022, with the Netherlands alone contributing roughly 76% of the continent's capacity, aided by favourable regulations and early pilot deployments.

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[5] World Bank Group & SERIS. (2019). Where sun meets water: Floating solar market report. World Bank.https://worldbank.org/

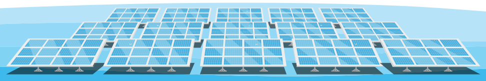
[6] Schill, C., Anderson, A., Baldus-Jeursen, C., Burnham, L., Micheli, L., Parlevliet, D., ... & Jahn, U. (2022). Soiling losses–impact on the performance of photovoltaic power plants.

[7] Qi, S. 2014. The Analysis of Complementation in PV Grid-Connected Part of Longyangxia 320 MWp, in Engineering. Xi'an: University of Technology.

[8] Gadzanku, S., Mirletz, H., Lee, N., Daw, J., & Warren, A. (2021). Benefits and critical knowledge gaps in determining the role of floating photovoltaics in the energy-water-food nexus. Sustainability, 13(8), 4317.

[9] IEA PVPS Task 13. (2025). Floating PV power plants: A review of energy yield, reliability, and maintenance (Report IEA-PVPS T13-31:2025). International Energy Agency.

[10] World Bank Group & SERIS. (2019). Where sun meets water: Floating solar market report. World Bank.https://worldbank.org/



Growth outside APAC and Europe is slower but rising. Regions such as the Middle East and Africa (MEA) and the Americas collectively hold approximately 7–13% of global FSPV capacity. Countries including Israel, Brazil, Chile, Ghana, and Australia have emerged as promising FSPV markets, with projects being commissioned on municipal reservoirs, mining pits, and irrigation ponds.

Global Distribution of FSPV Projects

At the global scale, the presence of more than 7,000 major reservoirs, as documented through the Global Reservoir and Dam Database (GRanD), highlights the immense theoretical surface area available for FSPV. If even 1–5% of total man-made reservoir surfaces worldwide were utilised for FSPV, as suggested by World Bank and SERIS modelling, the resulting technical potential would exceed multiple terawatts, far exceeding current global utility-scale solar deployment. FSPV installations are now present across all major regions of the world. From a few pilot systems in the early 2000s, global FSPV deployment grew to approximately 9.6 GW by 2024, with nearly 90% of this capacity concentrated in Asia. Europe, led by the Netherlands and France, has also emerged as a promising market, particularly for FSPV installations on artificial lakes and former mining sites. This rapid scale-up reflects greater technological confidence, a deeper understanding of floating system design, and maturing developer experience. Table 1 summarises FSPV projects by region, illustrating both geographic diversity and the clear concentration in Asia.

Table 1.Distribution of Major FSPV Projects by Region

Region	Major Projects
Asia	129
Europe	19
North America	11
South America	7
Africa	9
Australia & Oceania	8
Emerging Countries	6

This geographical diversity demonstrates FSPV's versatility and adaptability across climatic, geographic and regulatory conditions.

1.4 Objectives and Scope of this Report

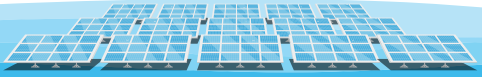
This report aims to provide a comprehensive analysis of FSPV systems, focusing specifically on their performance, potential assessment, environmental considerations, and operational challenges of FSPV.

The key objectives are to:

1. Assess waterbody wise FSPV potential using global modelling studies and GIS data.

2. Provide an overview of global and Indian FSPV deployment trends, highlighting market evolution and technological progress.
3. Compare FSPV with conventional ground-mounted PV, covering energy yield, land use, environmental implications, and system-level considerations.
4. Identify key benefits, challenges, and future directions, offering policy and research recommendations to support scale-up in India.

The scope of this report is limited to inland and nearshore floating solar installations, aligning with the categories recognised in international literature and technical guidelines. Offshore FPV, which faces substantially different technical and environmental conditions, is excluded from this analysis.



Comparative Assessment of Floating Solar PV and Ground-Mounted Solar PV

Comparative Assessment of Floating Solar PV and Ground-Mounted Solar PV

2.1 Solar PV Technology Overview

Solar PV technology has diversified into multiple applications as it has scaled globally. Traditional PV systems were dominated by ground-mounted utility-scale plants, valued for their relative simplicity and scalability. Over time, PV adoption broadened to include rooftop systems, building-integrated photovoltaics (BIPV), Agri-PV, and floating PV, each addressing different spatial, architectural, or energy-efficiency needs. So, the application landscape now includes:

- Ground-Mounted PV (GMPV): The most widespread form, suitable for large-scale generation but constrained by land availability, terrain, and ecological concerns.
- Floating PV (FSPV): A rapidly emerging segment that utilises water-based surfaces, offering co-benefits related to cooling, water conservation, and integration with hydropower[11].
- Rooftop and Distributed PV: Ideal for urban and residential contexts but limited by roof space, shading, and structural considerations.
- Building-Integrated PV (BIPV): Combining generation with building envelopes, promising but cost-sensitive and dependent on architectural integration.

Among these applications, FSPV has emerged as one of the fastest-growing sectors, bridging the gap between scalability and resource constraints. Preliminary performance comparisons suggested that floating systems may outperform ground-mounted systems in certain climates due to lower module operating temperatures, reduced soiling, and unique albedo interactions[12]. Subsequent field studies from Singapore and the Netherlands reinforced this trend, documenting measurable cooling benefits attributable to the evaporative and convective conditions above water[13]. Although performance gains vary by region and design, the evidence suggests that FSPV can offer an energy yield advantage of 5–10% in warmer climates. The technology has also benefited from several high-quality testbeds. The experimental facility of 1 MWp at Singapore's Tengeh Reservoir, developed by SERIS, is notable for comparing 10 different FSPV configurations under identical environmental conditions and tracking over 500 parameters. Insights from such platforms have informed global best practices on float design, thermal behaviour, and mechanical stability.

2.2 Comparative Assessment of FSPV and GMPV

FSPV differs from GMPV across several dimensions, including structural design, operational behaviour, environmental interactions, cost structures, safety requirements, installation practices, and long-term performance. To provide a consolidated understanding, this chapter presents a single, integrated comparison table covering all major parameters across the two technologies.

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[11] World Bank Group & SERIS. (2019). Where sun meets water: Floating solar market report. World Bank.https://worldbank.org/

[12] Choi, Y. K., Choi, W. S., & Lee, J. H. (2016). Empirical research on the efficiency of floating PV systems. Science of advanced materials, 8(3), 681-685.

[13] Dörenkämper, M., Wahed, A., Kumar, A., de Jong, M., Kroon, J., & Reindl, T. (2021). The cooling effect of floating PV in two different climate zones: A comparison of field test data from the Netherlands and Singapore. Solar Energy, 219, 15-23.

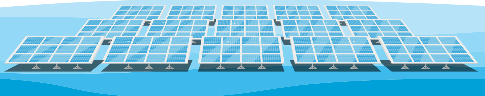
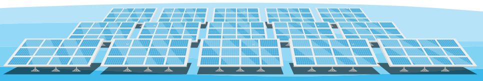


Table 2. Detailed Comparative Summary of FSPV with GMPV

Parameters	FSPV	GMPV
Site Requirement	• Uses water surfaces (reservoirs, ponds, hydropower lakes). • Eliminates land acquisition.	• Requires large land parcels • Land procurement is often costly and time-intensive.
Array Configuration	• Modular FSPV blocks on the water surface • Low tilt (5–15°) to reduce wind load • Row spacing fixed by floater geometry	• Flexible tilt optimisation by latitude • Adjustable row spacing • Large table configurations possible
Mounting Structure	• Floating platforms with anchors & moorings • Requires walkways for access • Subject to wind, wave, and current forces	• Pile/steel structures on land • Mainly subject to wind & snow loads • Tracking systems are easily integrated
Anchoring System	• Uses deadweight, pile, screw, or drag anchors depending on the reservoir bed	• Not applicable.
Mooring System	• Bank, bottom, catenary, or hybrid mooring • Designed for wind, waves, currents, and water-level fluctuations	• Not applicable.
Structural Loads	• Exposed to wind, waves, currents, and hydrodynamic motion • Design must account for water-level variation	• Exposed mainly to wind and snow loads • Absence of hydrodynamic forces simplifies design
Mechanical Stress	• Continuous movement induces wear on floaters, connectors, and mooring lines	• Largely static system • Predictable loading and fatigue behaviour • Inverters mounted under/near modules
Electrical Layout	• Inverters either on floats or onshore • Cables routed over floats; higher IP rating needed • Equipotential bonding is often required.	• Cables buried or in ground trays • Standard PV protection practices
Thermal Performance	• Cooler module temperatures due to evaporative cooling • Potential yield gains due to cooling	• Higher module temperatures, especially in hot climates • Greater temperature-related losses
Soiling Behaviour	• Generally lower dust deposition • May see bird droppings or organic deposits	• Higher soiling in dusty or arid environments • Frequent cleaning required
Energy Yield	• Potential 5–10% higher annual yield in warm climates (site-dependent)	• Stable yields • Optimised tilt improves annual generation.
O&M Accessibility	• Requires boats and floating access • O&M is more labour-intensive	• Easy access by foot/vehicle • Straightforward maintenance.
Cleaning Requirements	• Less dust cleaning • Must manage biofouling and use water-safe methods	• Frequent cleaning is needed in dusty regions • Easier operational routines
Durability & Lifetime	• Exposed to UV, humidity, bio-fouling, and movement-induced fatigue; long-term field data still emerging.	• Mature degradation understanding; materials have established 25–30-year performance profiles.
Safety	• Water-based O&M requires stringent safety measures • High humidity = lower insulation resistance • Cable movement risks require careful management	• Well-established and simpler safety protocols • Stable access paths • Lower moisture-related electrical risk



Parameters	FSPV	GMPV
Cable Management	• Requires slack loops, flotation trays • Flexible routing to avoid strain due to movement.	• Fixed routing • Cables buried or secured on ground structures.
Environmental Impact	• Reduces evaporation; may influence aquatic ecology • Negligible land-use impact.	• Causes land disturbance, vegetation loss, and soil compaction • No aquatic impact.
Evaporation Reduction	• Significant reduction through shading • Beneficial in arid/agricultural zones.	• Not applicable.
Temperature Impacts	• May alter water temperature or oxygen stratification depending on coverage.	• No impact.
CAPEX	• 25% higher due to floaters, moorings, anchoring, and marine-grade components.	• Lower and predictable • Standardised components.
OPEX	• Moderately higher (access, mooring inspection, safety requirements).	• Lower • Easy access reduces labour cost.
LCOE	• Competitive in land-constrained areas or where cooling benefits are high.	• Typically, the lowest-cost option due to economies of scale and a mature supply chain.
Scalability	• Suited for large reservoirs and hydropower lakes • Constrained by mooring complexity on very large surfaces.	• Highly scalable in desert/flat regions.
Hybridisation Potential	• Strong synergy with hydropower for balancing, shared infrastructure, and complementary generation.	• Often hybridised with wind/solar-agri systems • No hydropower synergy.
Installation Complexity	• Requires marine works, bathymetry analysis, barge access, and mooring design.	• Standard EPC practices; easier logistics.
Commissioning Time	• Longer due to water-based logistics and mooring alignment.	• Shorter and more predictable schedules.
Regulatory Maturity	• Evolving standards, significant variation in mooring and floater design guidelines.	• Fully mature codes and standards globally.

2.3 Technical Framework for FSPV

A thorough site assessment is foundation for any FSPV project, as waterbody characteristics directly influence design choices, anchoring strategies, energy modelling, and environmental considerations.

2.3.1 Bathymetry and reservoir morphology

Bathymetry determines mooring line lengths, anchor types, and the feasibility of placing arrays across different zones. The World Bank and SERIS emphasise that gentle slopes, predictable depth variations, and minimal submerged obstacles significantly reduce installation complexity. Hydropower reservoirs often have deeper basins with variable drafts, requiring dynamic mooring designs.

2.3.2 Water level variation

Seasonal fluctuations, especially in monsoon-fed or multi-purpose reservoirs, can exceed several meters. The IEA-PVPS (2025) report highlights that changes in water level alter mooring line tensions and movement envelopes, influencing array stability over time. Sites with highly unpredictable or rapid variations require adaptive mooring geometries.

2.3.3 Wind, wave, and fetch conditions

Wind regime and fetch length are critical loads for FSPV. Long fetch distances increase wave heights, imposing dynamic forces on floaters and electrical connections. Dörenkämper et al. (2021)[14] noted that Dutch testbeds with higher wind loading recorded increased mechanical stress and greater movement amplitudes compared with sheltered tropical reservoirs.

2.3.4 Water quality and corrosion risk

Conductivity, pH, bioactivity, and suspended particles affect material longevity. Hydropower and irrigation reservoirs generally exhibit lower salinity and reduced corrosion risk compared with estuarine or semi-marine conditions, which require marine-grade materials and reinforced electrical protection[15] .

2.3.5 Accessibility and logistics

Waterbody access via ramps, jetties, or temporary pontoons affects both construction and O&M. Remote reservoirs or those with restricted hydropower operations may require specialised equipment for installation.

2.4 Technical Design Considerations

FSPV system design involves five interconnected engineering domains: flotation, module racking, anchoring, electrical layout, and safety.

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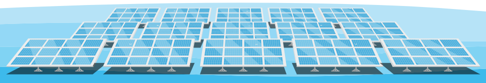
[14] Dörenkämper, M., Wahed, A., Kumar, A., de Jong, M., Kroon, J., & Reindl, T. (2021). The cooling effect of floating PV in two different climate zones: A comparison of field test data from the Netherlands and Singapore. Solar Energy, 219, 15-23.

[15] World Bank Group & SERIS. (2019). Where sun meets water: Floating solar market report. World Bank.https://worldbank.org/



2.4.1 Floater design and material selection

High-density polyethene (HDPE) modular floaters remain the dominant solution for freshwater FSPV. The World Bank/ SERIS report notes more than 90% of global FSPV uses HDPE due to its buoyancy, durability, and Ultra-Violet (UV) stability. In climates with large temperature swings, float structural integrity and inter-module flexibility are key design parameters. Alternative designs, such as pontoon barge systems and metal-framed platforms, are used in sites requiring greater load-bearing capacity or improved wave resistance. The typical component of the floater is shown in Figure 2.

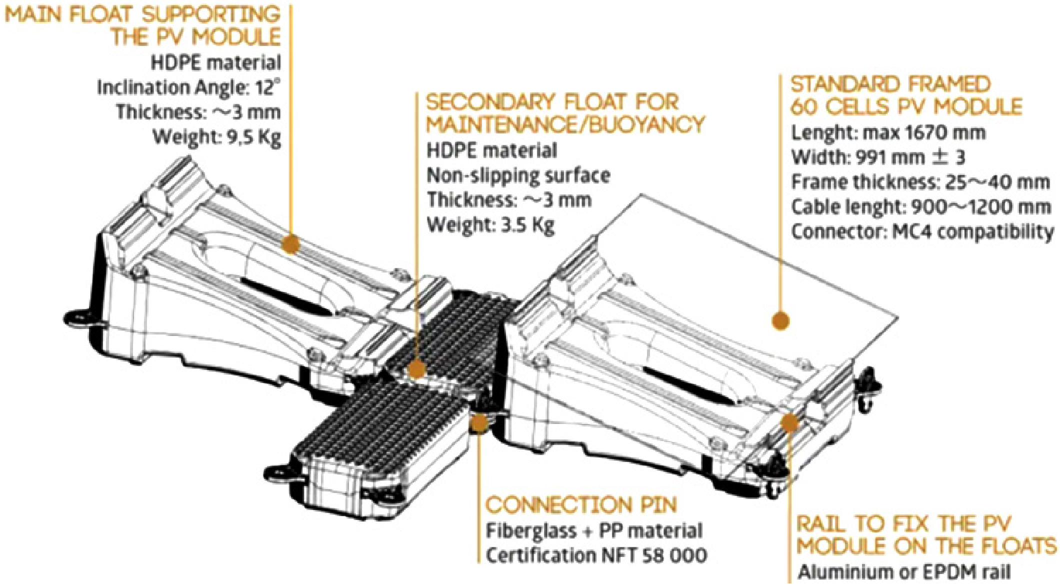


Figure 2. Component of Floaters

2.4.2 Anchoring and mooring systems

Anchoring and mooring form the structural backbone of any FSPV installation. Together, they ensure that the floating platform remains stable on the water surface, resists environmental forces, and maintains its designated layout throughout the plant's operational life. These systems must be designed with a clear understanding of waterbody behaviour, reservoir geometry, and local hydrodynamic conditions.

The primary function of an anchor is to secure the FSPV array in position and prevent drifting caused by wind loads, waves, water currents, and reservoir-level variations. The choice of anchor depends largely on the characteristics of the reservoir bed, such as sediment type, slope, compaction, and depth. The different types of anchors are shown in Figure 3.

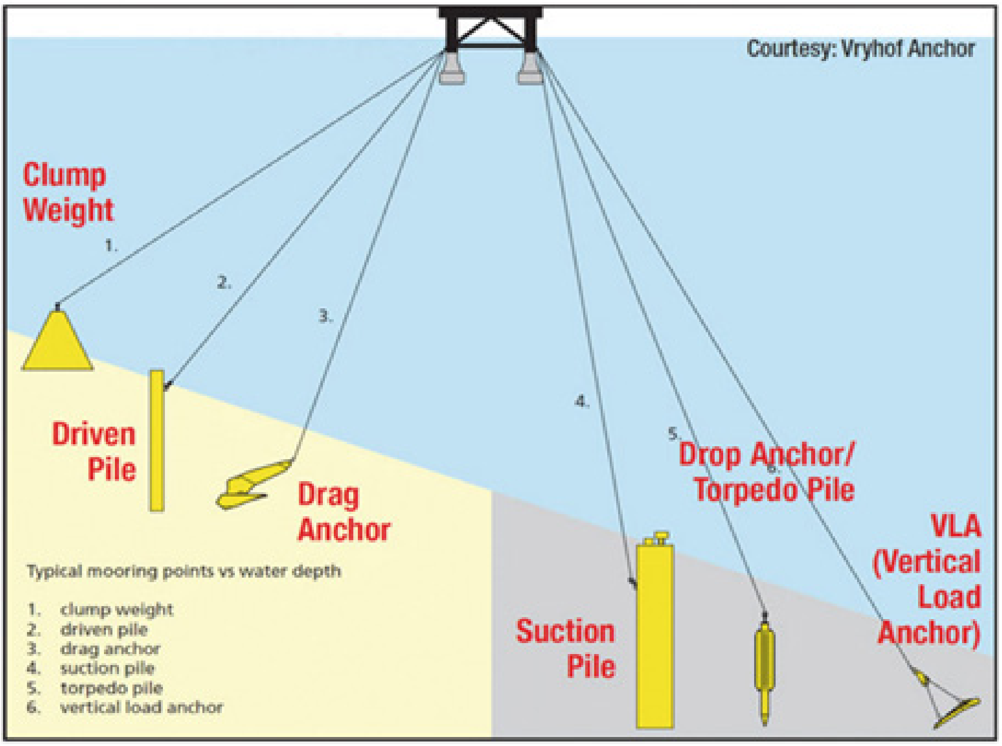


Figure 3. Different types of anchors [16]

Mooring ropes or chains connect the floating platform to the anchor, allowing the FSPV array to flex, rotate, and absorb hydrodynamic forces without compromising structural integrity. Mooring systems must accommodate water-level variation, wind-induced drift, and platform movement, while maintaining the stability of electrical connections and walkways.

Mooring lines are typically made from:

- High-tensile steel chains
- Synthetic ropes (e.g., polyester, polypropylene)
- Hybrid combinations of steel and synthetic fibers

Synthetic ropes offer flexibility and corrosion resistance, while steel chains provide superior weight and stability inhigh-wind or deep-water environments. The FSPV installations generally adopt one of the following mooring strategies:

- Bank anchoring (suitable for narrow reservoirs)
- Bottom anchoring (for moderate depths and soft sediment)
- Hybrid catenary systems (for deeper basins or fluctuating water levels)

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[16] Khalifeh, M., & Saasen, A. (2020). Different categories of working units. In Introduction to Permanent Plug and Abandonment of Wells (pp. 137-163). Cham: Springer International Publishing.

2.4.3 Module mounting and tilt considerations

Most FSPV installations use fixed low-tilt angles (5–15°) to reduce wind uplift. Experiments conducted at Singapore's 1 MWp Tengeh testbed showed that tilt angle optimisation must consider wind loading, soiling, and thermal performance simultaneously[17].

2.4.4 DC/AC electrical layout

FSPV requires enhanced electrical protection due to proximity to water, including:

- Higher IP (Ingress Protection) ratings
- Double insulation on DC cabling
- UV-protected floating cable trays
- Controlled cable slack to avoid tension under movement

Inverters may be situated onshore or on floating platforms. While shore-based configurations simplify maintenance, floating inverter platforms reduce DC cabling distances but require structural reinforcement and additional safety provisioning[18] .

2.4.5 Safety and compliance

FSPV systems must manage electrical safety risks in wet environments. The reported studies emphasise the need for specialised grounding schemes, leakage current protection, and personnel safety protocols for water-based main-tenance activities. Compliance frameworks are evolving, with IEC committees developing dedicated FSPV standards.

2.5 Operation and Maintenance (O&M) Considerations

FSPV O&M differs from ground-mounted systems primarily due to access and water-safety constraints.

2.5.1 Access and inspection

Routine inspections require boats, amphibious vehicles, or floating walkways. Safety protocols must account for slip risks, electrical isolation, and weather-induced movement.

2.5.2 Mechanical wear and material degradation

Floaters undergo continuous mechanical stress. UV exposure, waterline abrasion, and biofouling can accelerate degradation relative to land-based structures. The long-term durability data remain limited due to the young age of most FSPV fleets.

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[17] World Bank Group & SERIS. (2019). Where sun meets water: Floating solar market report. World Bank.https://worldbank.org/

[18] IEA PVPS Task 13. (2025). Floating PV power plants: A review of energy yield, reliability, and maintenance (Report IEA-PVPS T13-31:2025). International Energy Agency.

2.5.3 Cable management and moisture protection

Cables exposed to moisture require periodic checks for insulation integrity, connector corrosion, and mechanical strain. Cable floatation systems and slack loops must be carefully monitored to avoid submergence or snapping during high-wind events.

2.5.4 Cleaning and biofouling

Algal growth, mould, and aquatic droppings on lower floater surfaces contribute to added weight and must be managed proactively. Some reservoirs require biofouling-safe coatings or periodic underwater cleaning.

2.6 Environmental Considerations

2.6.1 Evaporation reduction

Partial shading of water surfaces reduces evaporation, an effect studied in irrigation reservoirs, where measurable reductions were recorded under FSPV coverage.

2.6.2 Impacts on aquatic ecology

Shade alters water temperature stratification, dissolved oxygen levels, and biological activity. Gadzanku et al. (2021)[19] emphasise that evidence remains site-specific and call for systematic environmental monitoring across FSPV projects.

2.6.3 Visual and land-use impacts

FSPV offers lower landscape disruption than land-based PV, particularly in densely populated regions or agricultural zones.

2.6.4 Material leaching concerns

Long-term data on chemical leaching from floaters is limited. There is a need for material testing, especially under high UV exposure and bioactivity conditions.

2.7 Challenges Identified in the Deployment of Floating Solar PV

2.7.1 Mechanical instability and float dynamics

FPV structures are constantly subject to hydrodynamic forces, which reveal some problems, such as:

- Loosening of inter-float joints
- Misalignment in platform sections
- Uneven buoyancy across float blocks

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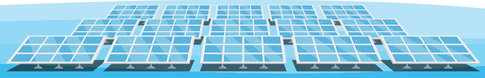
[19] Gadzanku, S., Mirletz, H., Lee, N., Daw, J., & Warren, A. (2021). Benefits and critical knowledge gaps in determining the role of floating photovoltaics in the energy-water-food nexus. Sustainability, 13(8), 4317.



Such instability increases stress on modules, walkways, and cables, requiring more frequent inspections and structural adjustments.

2.7.2 Cable fatigue, abrasion, and electrical risks

Cable management is more complex on water:

- Continuous movement creates bending and abrasion
- Cable trays require periodic tension adjustments
- Occasional DC cable breakage was reported by all developers

This indicates the need for stronger mechanical protection and FPV-specific cable routing designs.

2.7.3 Restricted access and o&m constraints

Technicians reported difficulties related to:

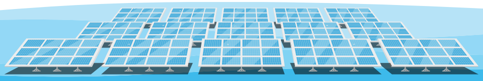
- Platform instability during wind and rainfall
- Slippery walkways
- Very limited access during monsoon months
- Safety risks during night and early-morning maintenance

The result is a higher O&M effort per MW compared to GMPV projects.

2.7.4 Environmental uncertainty and need for long-term data

Although in the initial phase of operation of the FSPV plant, environmental assessment showed no major deviations in water quality, biodiversity, or sediment chemistry, some long-term concerns remain:

- Potential microplastic leaching from float materials
- Effects on dissolved oxygen and underwater light penetration
- Alteration of aquatic habitat conditions



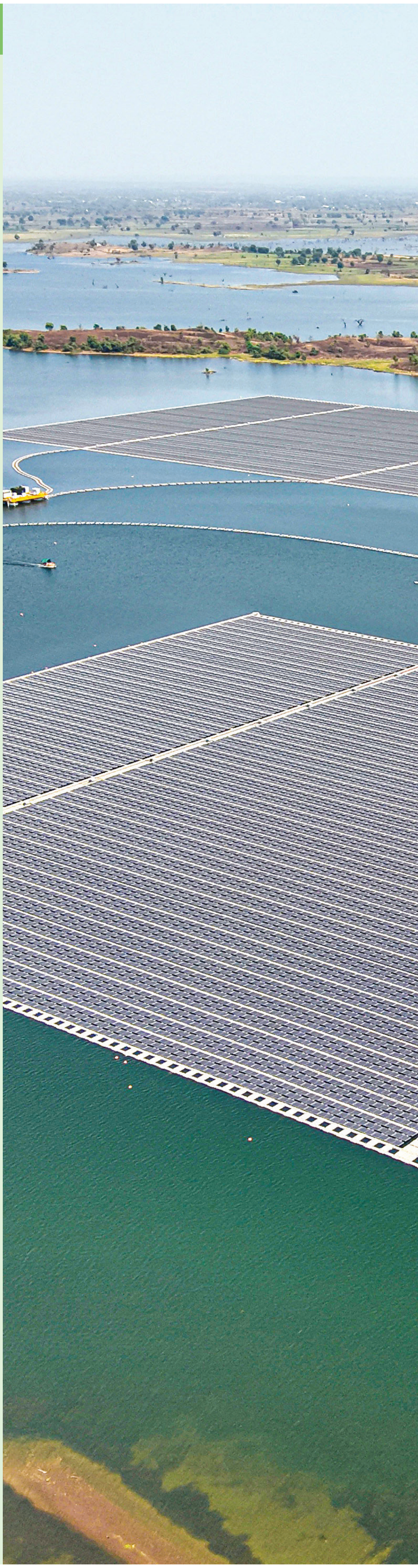
2.8 Summary

The comparative analysis of FSPV and GMPV highlights a clear evolution in solar deployment strategies driven by land constraints, environmental considerations, and the need for higher efficiency. While GMPV remains the most mature, cost-effective, and operationally straightforward solution with well-established standards and predictable performance, FSPV introduces a compelling alternative that leverages underutilised water surfaces and offers distinct performance and environmental advantages.

FSPV demonstrates notable benefits, including improved thermal performance, reduced soiling, and the potential for higher energy yields, particularly in warm climates. Its ability to minimise land-use conflicts and reduce water evaporation further strengthens its relevance in regions facing land scarcity and water stress. Additionally, its compatibility with hydropower infrastructure presents unique opportunities for hybrid energy systems and grid stability.

However, these advantages are balanced by increased complexity in design, installation, and operation. The dependence on site-specific hydrological and environmental conditions, coupled with challenges such as mechanical instability, cable fatigue, safety risks, and evolving regulatory frameworks, indicates that FSPV is still in a developmental phase compared to GMPV. The lack of long-term performance data and standardisation further underscores the need for continued research, monitoring, and technological refinement.

Ultimately, neither technology can be considered universally superior. Instead, their suitability depends on site conditions, resource availability, economic considerations, and project objectives. FSPV is best positioned as a complementary solution to traditional ground-mounted systems, particularly in water-rich or land-constrained regions. As technological advancements continue and operational experience grows, FSPV is expected to play an increasingly significant role in the global solar energy mix, contributing to a more diversified, efficient, and sustainable renewable energy landscape.



Energy Yield Assessment of FSPV Systems

Energy Yield Assessment of FSPV Systems

3.1 Energy Yield Assessment

The energy yield assessment (EYA) for FSPV systems requires careful consideration of temperature effects, energy yield comparison, and operational factors that differentiate FSPV from conventional ground-mounted PV. This assessment is crucial for determining a project's viability, optimising its design, and managing risks. However, FSPV entails site-specific design complexities, such as corrosion risks, biofouling, anchoring maintenance, and higher initial costs (typically 25% more than GMPV)[20]. However, their performance benefits most notably lower module temperatures from evaporative cooling can partially offset these cost differences.

In this study, a systematic simulation-based assessment was carried out to compare the hourly generation of FSPV and GMPV systems using the System Advisor Model (SAM). The assessment framework ensures methodological consistency across all selected sites and isolates the effect of tilt angle, soiling, and water-induced cooling. To ensure comparability, identical system configurations were adopted across all states. The inputs for simulation and assumptions are listed in Table 3

Table 3.Technical Detail for Simulation

Category	Parameter	Input value
Location and Resource	Site coordinates, solar resource file	NSRDB data
	Data Type	Typical Meteorological Year (TMY) data
Module	Model	IEC61853 Single Diode Model
	Module type	MonoSi (585 Wp) No. of cell in series: 78
	Module dimensions	Area: 2.78 m^2 Aspect ratio: 2.166
	Optical and Spectral behaviour	Module cover: Standard glass
	Air mass polynomial coefficients	a_0: 0.9417; a_1: 0.06516; a_2: -0.02022; a_3: 0.00219; a_4:0.000091
	STC parameters	Diode factor (n): 0.99
	STC temp coefficients	alpha (A/°C): 0.0078 beta (V/°C): -0.183 gamma (%/°C): -0.39
	R_{sh} parameters	C1: 386.03 C2: 451.442 C3: 0.644068
	Rs parameters	D1: 0.805391 D2: 0 D3: 0.0291395

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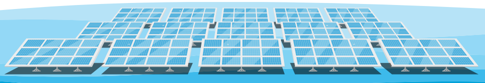
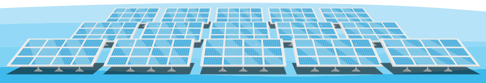
[20] Ramasamy, V., & Margolis, R. (2021). Floating photovoltaic system cost benchmark: Q1 2021 installations on artificial water bodies (No. NREL/TP-7A40-80695). National Renewable Energy Laboratory (NREL), Golden, CO (United States).



Inverter	Inverter efficiency	98.8%
	Operating ranges	Nominal AC voltage: 690 V_{ac} Maximum DC voltage: 1500 V_{dc} Maximum DC current: 3975 A_{dc} Minimum MPPT DC voltage: 978 V_{dc} Nominal DC voltage: 1239 V_{dc} Maximum MPPT DC voltage: 1500 V_{dc} No. of MPPT inputs: 1
	Losses	Power consumption during operation: 2500W_{dc} Power consumption at night: 230 W_{ac}
System Design	AC sizing	DC to AC ratio: 1.30
	Electrical configuration	Subarray: 1 Module per string in subarray: 26 Strings in parallel in subarray: 85
	Tracking & Orientation	Fixed Tilt (deg): 5 Azimuth (deg): 180 Ground coverage ratio: 0.3
Shading & Layout	Self-Shading	Thin film (Linear)
	Array dimensions for Self-Shading	Portrait
Losses	Irradiance loss	Soiling loss: 1–3%
	DC Losses	Module mismatch (%): 2 Diode and connections (%): 0.5 DC wiring (%): 2
	AC Losses	AC wiring :1(%) of AC output
	Transformer no-load loss	0% of inverter AC capacity
	Transformer load loss	0% of AC output
	Transformer loss	0% of AC output
DC Degradation	Annual DC degradation rate	0.5% /year



The current PV plant simulation tools (SAM, PVsyst) do not contain dedicated FSPV models. Therefore, a temperature correction approach was used to account for evaporative cooling. To differentiate floating solar generation from ground-mounted systems, a temperature correction has been applied to the Typical Meteorological Year (TMY) data. This correction accounts for the cooling effect of water bodies on the module temperature reported, [21, 22] and is expressed as:

$$T_{correct}=4.27+(0.55*T_{ambient}(t)) \qquad (1)$$

where $T_{correct}$ is the temperature above the water surface, $T_{ambient}$ is the ambient temperature over the ground, and t represents time in hourly values.

To fully understand performance behaviour, three tilt configurations were analysed:

1. 5° fixed tilt
2. Latitude tilt
3. Optimum tilt (site-specific annual maximum)

For floating systems, only the 5° tilt was modelled (as higher tilts increase wind loading and compromise array stability).

Five comparative scenarios were evaluated

Case 1. Optimum tilt vs fixed tilt (5°) at 1% soil loss

Case 2. Optimum tilt vs fixed tilt (5°) at 2% soil loss

Case 3. Optimum tilt vs fixed tilt (5°) at 3% soil loss

Case 4. Optimum tilt vs fixed tilt (5°) considering surface water temp at 2% soil loss

Case 5. Fixed tilt (5°) vs fixed tilt (5°) considering surface water temp at 2% soil loss

These scenarios differentiate the relative impacts of tilt optimisation, soiling variation, and evaporative cooling. The representative sites chosen to cover 29 states for the analysis were the largest lakes in each state, and the comparative Energy Yield given in Table 4, and the results for the major states have been plotted in Figure 4.

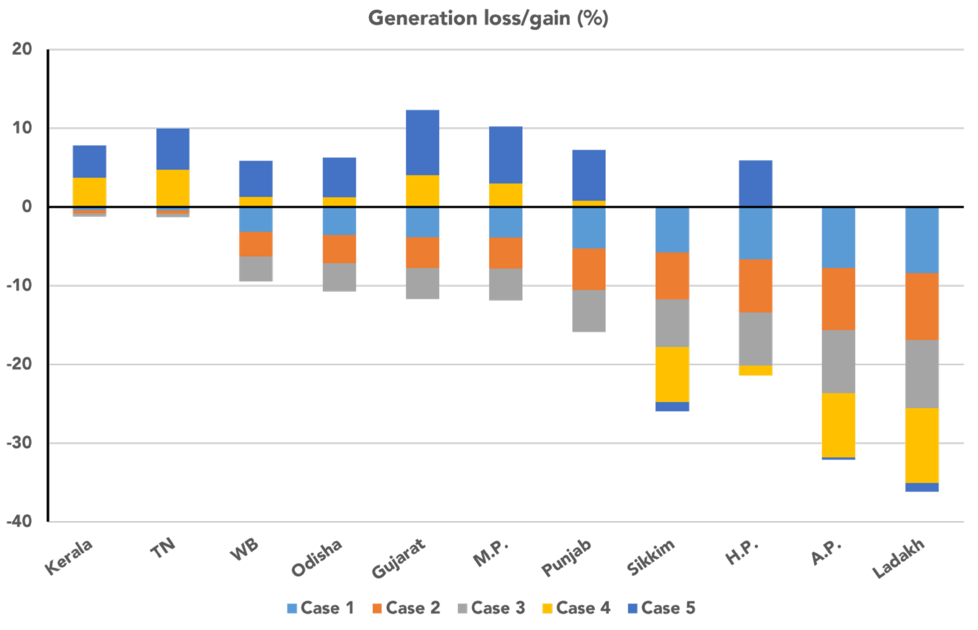


Figure 4.: Generation loss and gain of the biggest lake in different states

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[21] Ficklin, D. L., Luo, Y., Stewart, I. T., & Maurer, E. P. (2012). Development and application of a hydroclimatological stream temperature model within the Soil and Water Assessment Tool. Water Resources Research, 48(1). https://doi.org/10.1029/2011WR011256

[22] Rahaman, M. A., Chambers, T. L., Fekih, A., Wiecheteck, G., Carranza, G., & Possetti, G. R. C. (2023). Floating photovoltaic module temperature estimation: Modeling and comparison. Renewable Energy, 208, 162-180.https://doi.org/10.1016/j.renene.2023.03.076

Case 1–3

Optimum tilt vs. Fixed tilt at 5° with varying soil losses): The energy generation losses remained consistent at approximately –4.5% to –4.6%, regardless of soiling levels (1–3%), indicating that under site-specific conditions, a fixed 5° tilt configuration incurs only a marginal performance penalty compared to the optimum tilt angle.

Case 4

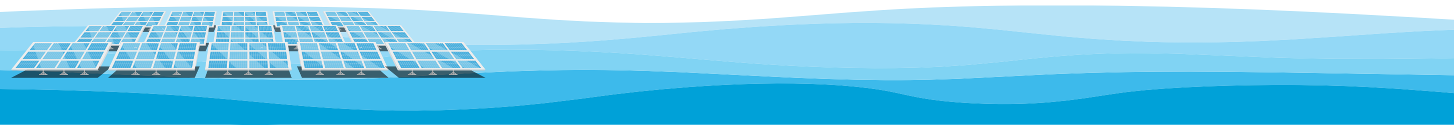
(Optimum tilt vs. Fixed tilt at 5° with water surface cooling effect and 2% soil loss): A positive gain of +2.35% was observed, indicating that the water surface cooling effectively offset tilt and soiling losses. The reduction in module operating temperature from the floating configuration improved conversion efficiency, emphasising the critical influence of water–PV thermal interaction on overall FSPV performance.

Case 5

(Fixed tilt at 5° vs. Fixed tilt at 5° with water surface cooling at 2% soil loss): The maximum improvement of +6.74% was recorded in this scenario, where both systems employed fixed tilt, isolating the effect of water cooling. The proximity of the FSPV modules to the water surface significantly lowered operating temperatures, confirming that thermal regulation through evaporative cooling is a key driver of enhanced generation efficiency in floating PV systems.

Table 4. Energy Yield Assessment Comparison of GMPV and FSPV Plants

State	Lat (°)	Long (°)	Lake Name	PV Plant Generation loss/gain (%)				
				Case 1	Case 2	Case 3	Case 4	Case 5
Kerala	9.84	76.97	Nakshathra Kunnu	-0.38	-0.39	-0.40	3.71	4.12
Tamil Nadu	11.80	77.81	Metturdam	-0.41	-0.42	-0.42	4.77	5.21
Puducherry	11.94	79.75	Osudu Lake	-0.42	-0.42	-0.43	3.94	4.38
Andhra Pradesh	14.49	79.30	Somasila Reservoir	-0.74	-0.75	-0.76	4.22	5.00
Goa	15.21	74.18	Salaulim Dam	-1.71	-1.75	-1.78	4.20	6.05
Karnataka	16.33	75.89	Sugarcane Farm	-2.07	-2.09	-2.11	2.68	4.87
Telangana	17.75	77.93	Singur Dam Reservoir	-2.37	-2.39	-2.41	2.18	4.68
Maharashtra	19.49	75.37	Nath Sagar	-2.46	-2.48	-2.51	2.51	5.12
West Bengal	22.96	86.75	Mukutmanipur Dam	-3.13	-3.15	-3.17	1.29	4.58
Odisha	21.52	83.85	Hirakud Reservoir	-3.54	-3.57	-3.60	1.26	5.01
Tripura	23.46	91.81	Dumboor	-3.60	-3.64	-3.68	0.71	4.51
Rajasthan	24.92	75.58	Rana Pratap Sagar	-3.72	-3.76	-3.81	3.35	7.39
Manipur	24.51	93.82	Loktak Lake	-3.74	-3.79	-3.83	-0.06	3.87
Jharkhand	23.79	86.81	Maithon Reservoir	-3.82	-3.84	-3.86	0.50	4.51
Gujarat	24.07	68.95	Rann of Katch	-3.84	-3.89	-3.94	4.05	8.26



State	Lat (°)	Long (°)	Lake Name	PV Plant Generation loss/gain (%)				
				Case 1	Case 2	Case 3	Case 4	Case 5
Madhya Pradesh	24.70	75.55	Gandhi Sagar	-3.90	-3.95	-4.00	2.99	7.23
Uttar Pradesh	24.20	83.01	Govind Ballabh Pant Sagar	-4.07	-4.09	-4.12	0.59	4.89
Nagaland	26.23	94.29	Doyang Dam Reservoir	-4.27	-4.32	-4.37	-0.33	4.17
Chhattisgarh	22.61	82.60	Hadeo Bango dam	-4.64	-4.68	-4.72	-0.08	4.83
Bihar	24.88	86.64	Hanuman Reservoir	-4.71	-4.74	-4.76	-0.53	4.41
Meghalaya	25.66	91.90	Umiam Lake	-5.19	-5.22	-5.26	-3.03	2.32
Punjab	31.38	76.37	Overhead Water Tank	-5.25	-5.30	-5.35	0.82	6.46
Sikkim	28.00	88.80	Pauhunri	-5.77	-5.92	-6.07	-7.02	-1.17
Chandigarh	30.74	76.82	Sukhna Lake	-6.31	-6.37	-6.43	-0.35	6.43
Uttarakhand	29.52	78.76	Ramganga Reservoir	-6.57	-6.60	-6.63	-2.55	4.33
Himachal Pradesh	31.97	75.95	Maharana Pratap Sagar	-6.66	-6.72	-6.78	-1.22	5.89
Jammu And Kashmir	33.14	73.64	Mangla Dam Lake	-6.78	-6.84	-6.89	-0.18	7.15
Assam	25.53	92.71	Umrong Dam	-7.73	-7.87	-8.01	-5.76	2.29
Arunachal Pradesh	29.23	96.19	Lal Bahadur Shastri Lake	-7.73	-7.87	-8.01	-8.16	-0.32
Ladakh	35.22	79.82	Aksai Chin Lake	-8.38	-8.51	-8.65	-9.52	-1.11

Case 1: Optimum tilt vs fixed tilt (5°) @ 1% soil loss
Case 2: Optimum tilt vs fixed tilt (5°) @ 2% soil loss
Case 3: Optimum tilt vs fixed tilt (5°) @ 3% soil loss
Case 4: Optimum tilt vs fixed tilt (5°) considering surface water temp @ 2% soil loss
Case 5: Fixed tilt (5°) vs fixed tilt (5°) considering surface water temp @ 2% soil loss

3.2 Summary

The energy yield assessment demonstrates that FSPV systems present a nuanced but promising performance advantage over conventional GMPV, particularly when thermal effects are properly accounted for. While fixed low-tilt configurations inherent to FSPV result in a modest energy penalty (typically ~4–5%) compared to optimum tilt ground-mounted systems, this disadvantage is consistently mitigated and often surpassed by the cooling benefits provided by the water surface.

The simulation results clearly establish that evaporative cooling is the dominant factor influencing FSPV performance. When incorporated through temperature correction, it offsets tilt and soiling losses and delivers measurable gains in energy yield. In several states, especially those with warmer climates, FSPV systems achieved improvements ranging from approximately 2% to over 6%, with peak gains exceeding 8% in favourable conditions. This confirms that thermal regulation through proximity to water is a key driver of enhanced module efficiency and overall system performance.

At the same time, the analysis highlights the strong site dependency of FSPV performance. Regions with high ambient temperatures and stable solar resources benefit the most, whereas colder or high-altitude regions show limited or even negative gains due to reduced cooling advantages and suboptimal irradiance conditions. This reinforces the importance of location-specific modelling and careful resource assessment when evaluating FSPV feasibility.

The study also underscores methodological challenges, particularly the absence of dedicated FSPV models in standard simulation tools. The use of temperature correction represents a practical interim solution, but it also points to the need for more advanced modelling frameworks that can explicitly capture water atmosphere PV interactions, dynamic thermal behaviour, and hydrodynamic influences.

Overall, the findings indicate that FSPV can achieve competitive and in many cases superior energy yields compared to GMPV, provided that site conditions are favourable and system design is optimised. While higher capital costs and operational complexities remain important considerations, the demonstrated performance gains strengthen the case for FSPV as a viable and efficient alternative in India's solar deployment strategy. As modelling techniques improve and more field data become available, energy yield assessments will become increasingly accurate, further supporting informed decision-making and large-scale adoption of floating solar technologies.

Floating Solar Potential Assessment

Floating Solar Potential Assessment

4.1 Significance of Assessing Floating Solar Potential

Assessing floating solar potential is not just a technical exercise, it is a strategic step that determines where, how, and whether FSPV can be deployed effectively and sustainably. Its significance lies in enabling informed decisions across energy planning, environmental management, and economic investment. It enables accurate estimation of performance benefits over GMPV, supports water conservation and ecological balance, and identifies technical and operational risks early. Additionally, it strengthens economic viability, guides investment decisions, and facilitates integration with existing infrastructure such as hydropower, ultimately supporting efficient and sustainable large-scale renewable energy deployment. A systematic assessment of floating solar potential is essential for:

The evaluation of floating solar potential holds significant importance for several reasons:

1. Optimising land resources

- In land-scarce regions, FSPV systems provide a practical alternative by utilising underutilised water surfaces such as reservoirs, lakes, and industrial ponds.
- This approach reduces the pressure on agricultural, industrial, and residential land, enabling sustainable development without competing for critical land resources.

2. Enhancing solar efficiency

- Water bodies offer a cooling effect that reduces the operating temperature of solar panels, thereby increasing their efficiency and energy output.
- Proper assessment ensures the identification of water bodies where these efficiency gains can be maximised.

3. Mitigating water evaporation

- Floating solar installations reduce water evaporation from reservoirs, which is particularly beneficial in regions facing water scarcity.
- Assessment ensures these systems are strategically located to provide dual benefits of energy generation and water conservation.

4. Strengthening energy security

- Identifying suitable locations for FSPV systems enables diversification of energy sources, reducing reliance on fossil fuels and enhancing energy security.
- Comprehensive potential assessments help optimise resource allocation and accelerate the transition to clean energy.

5. Minimising environmental impact

- Proper evaluation incorporates environmental considerations, ensuring that installations are placed in loctions that minimise disruption to aquatic ecosystems and biodiversity.
- Assessment frameworks also identify opportunities to align with existing water resource management plans.

6. Supporting policy and strategic planning

- A robust assessment provides actionable data to policymakers, helping shape informed decisions regarding renewable energy targets and infrastructure investment.
- It enables the identification of priority zones for development, ensuring efficient deployment of resources.

7. Driving technological and economic advancements

- A clear understanding of floating solar potential encourages innovation in anchoring systems, floating plat-forms, and efficient solar technologies.
- Economic analyses integrated into the assessment provide insights into cost-effectiveness and long-term viability, attracting private investment and international collaboration.

By systematically assessing floating solar potential, nations can unlock a transformative opportunity to expand rene able energy capacity, address land and water management challenges, and contribute to a sustainable and resilient energy future.

4.2 Assessment of FSPV Potential

The FSPV potential assessment requires an in-depth analysis of various parameters, including those used in ground-mounted solar potential assessment, such as road networks, transmission substations, and solar irradiance data, to ensure optimal site selection, efficiency, and sustainability. The following are the critical parameters considered in the Floating Solar Potential Assessment, along with their descriptions:

Water bodies

The different water bodies present varying levels of suitability for FSPV systems due to size, stability, and usage patterns. For instance, reservoirs used for irrigation or drinking water may impose operational constraints, whereas industrial ponds might have fewer restrictions.

Seasonality

It indicates the seasonal fluctuations in water levels, including dry and wet season variations. Seasonal water level changes can affect the stability and anchoring of floating solar platforms. Understanding water seasonality ensures that installations are robust and operational throughout the year, avoiding damage during extreme fluctuations.

Bathymetry

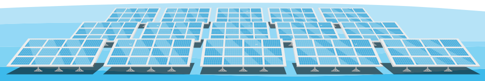
It is a study of the depth and topography of the water body's bed. Bathymetry data is essential for designing anchoring and mooring systems for the FSPV structures. Shallow water bodies may require different engineering solutions than deep reservoirs, and uneven beds can increase deployment complexity and costs.

Road network

Proximity to existing roads is crucial for the transportation of solar panels and other equipment. The assessment evaluates the road network to ensure that selected sites are accessible for construction and maintenance.

Transmission substations

Proximity to transmission substations is important for integrating solar power into the grid. The assessment considers the location of substations to ensure that solar energy can be efficiently transmitted from the generation site to the grid.



Solar irradiance data

It indicates the amount of solar energy received at different locations. By incorporating solar irradiance data, the assessment can determine the potential energy output of various sites.

NISE emphasises a data-backed analysis approach, utilising high-quality GeoBase data to ensure accuracy and reliability. The datasets used for the updated solar potential assessment are shown in Table 5.

Table 5. Data sets considered for the solar potential assessment

S.No.	Parameter	Source
1	Water bodies (lakes)	Hydro-Lakes Dataset[23]
2	Water Availability (Seasonality)	Global Surface Water (GSW)[24]
3	Bathymetry	Globathy[25]
4	Road network	Open Street Map (OSM)
5	Transmission substation network	OSM
6	Solar Irradiance data	Global Solar Atlas[26]

By integrating these diverse data sets, the updated methodology provides a more accurate and reliable assessment of India's floating solar potential.

4.3 Methodology

This section provides a comprehensive methodology for assessing the floating solar potential in India. It involves the systematic collection, processing, and analysis of spatial and environmental datasets, such as different water bodies with their level of fluctuation season-wise and depth of water from various authoritative sources, to ensure accurate and reliable results. The evaluation process also considered geographic factors, solar irradiance, and infrastructural proximity to ensure that the selected sites are optimal for FSPV installations. The methodology considered for the floating solar potential of India is provided in Figure 5. The procedure followed is explained using a case study to overcome the visibility of these features on the map. The mentioned parameters are applied to assess solar potential across India. The administrative boundaries for the assessment are validated from the Survey of India[27]. The details of the parameters are provided as follows:

4.3.1 Solar irradiance evaluation

Global Horizontal Irradiance (GHI) is considered an important parameter for the solar potential assessment. It is the total amount of shortwave radiation received from the sun by a surface that is horizontal to the ground. It is a critical factor in assessing the solar energy potential of a region to ensure that selected regions have sufficient solar radiation. The GHI data is sourced from the Global Solar Atlas[28] and GHI map of India is shown in Figure 6. For this assessment, regions with a GHI value greater than 4.5 kWh/m^2/day are considered viable for solar power plant installations. The high GHI values indicate regions with a strong potential for capturing solar energy, which is essential for the efficient functioning of solar PV modules. By focusing on areas with GHI above 4.5 kWh/m^2/day, the assessment prioritises regions that maximise the efficiency and output of solar installations.

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[23] Messager, M. L., Lehner, B., Grill, G., Nedeva, I., & Schmitt, O. (2016). Estimating the volume and age of water stored in global lakes using a geo-statistical approach. Nature communications, 7(1), 13603.

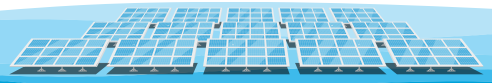
[24] Pekel, J. F., Cottam, A., Gorelick, N., & Belward, A. S. (2016). High-resolution mapping of global surface water and its long-term changes. Nature, 540(7633), 418-422.

[25] Khazaei, B., Read, L. K., Casali, M., Sampson, K. M., & Yates, D. N. (2022). GLOBathy, the global lakes bathymetry dataset. Scientific Data, 9(1), 36.

[26] https://globalsolaratlas.info/

[27] https://onlinemaps.surveyofindia.gov.in/Digital_Product_Show.aspx

[28] https://globalsolaratlas.info/map



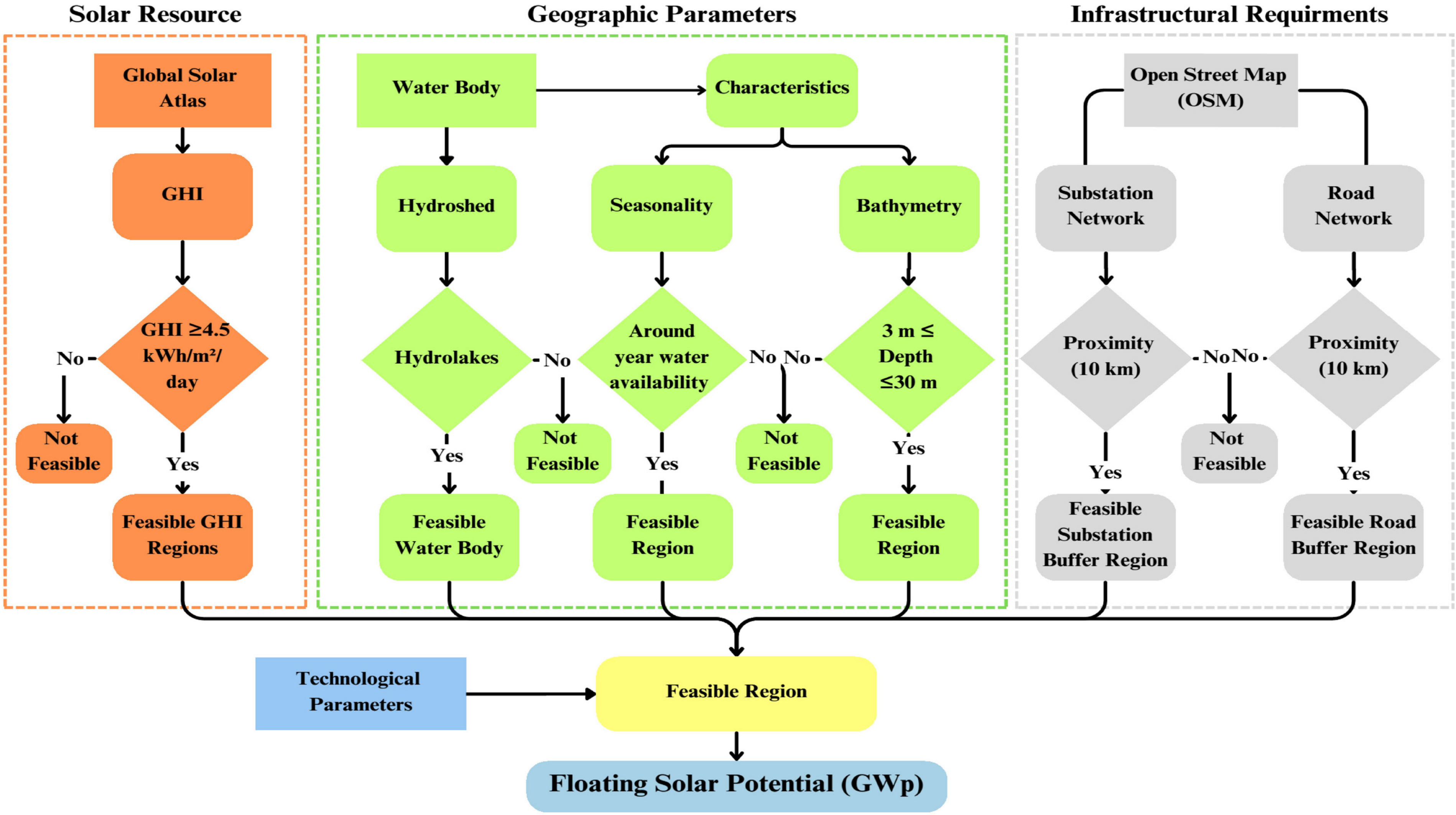


Figure 5. Flowchart of the methodology used for the floating solar potential assessment

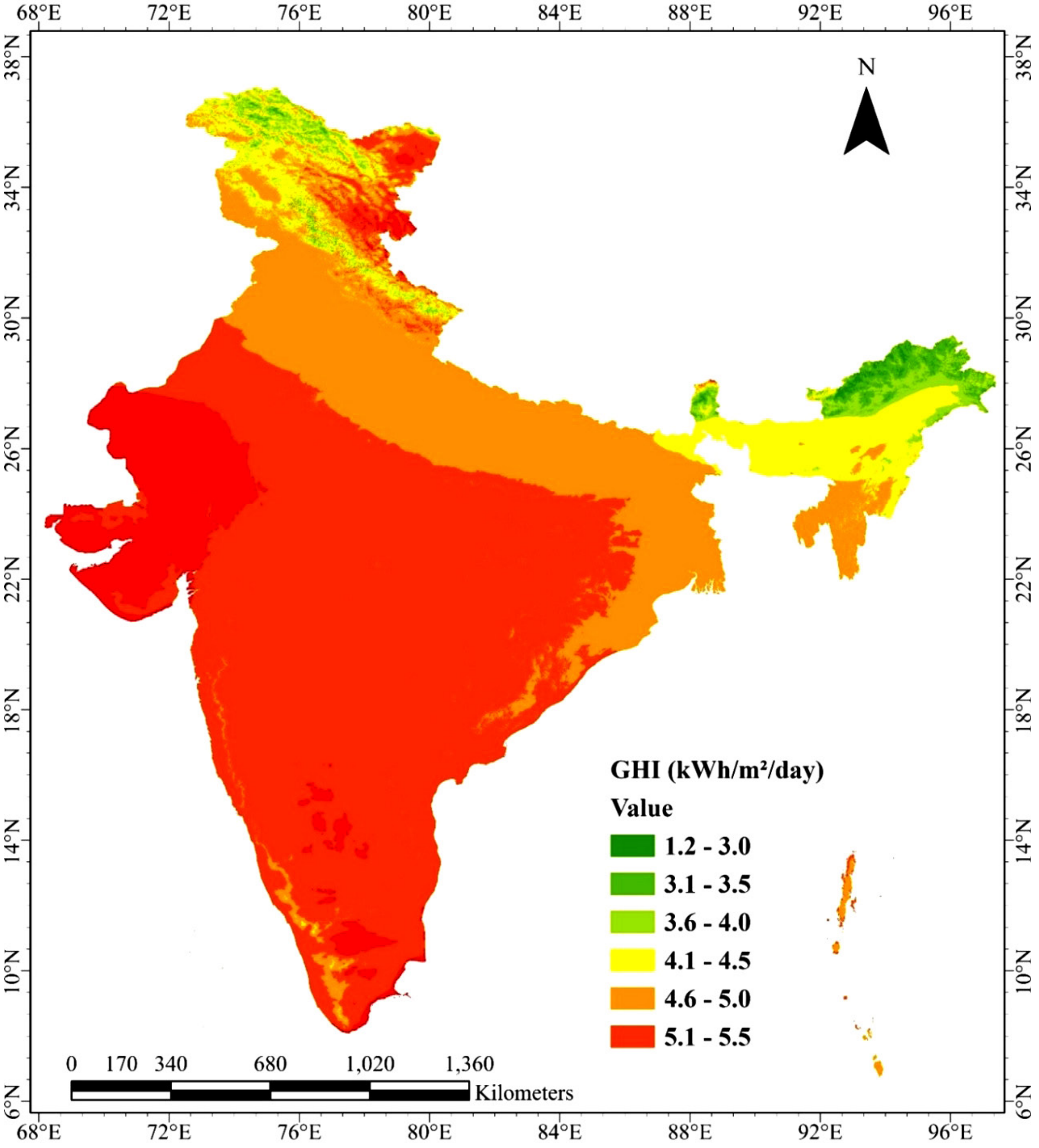


Figure 6. Solar Radiation (GHI) Map of India

4.3.2 Infrastructural evaluation

The infrastructural evaluation assesses the proximity of potential sites to road networks and electrical substations to ensure logistical feasibility and efficient power transmission. The proximity of potential solar sites to road networks is evaluated using Open Street Map (OSM) data. Sites within a specified distance of 10 km from the nearest road are considered feasible, excluding a 2 km distance from the road for the future scope of expansion of the road network. It ensures accessibility for the transportation of materials, installation, and ongoing maintenance. India road network and its proximity at a distance of 10 km is shown in Figure 7.

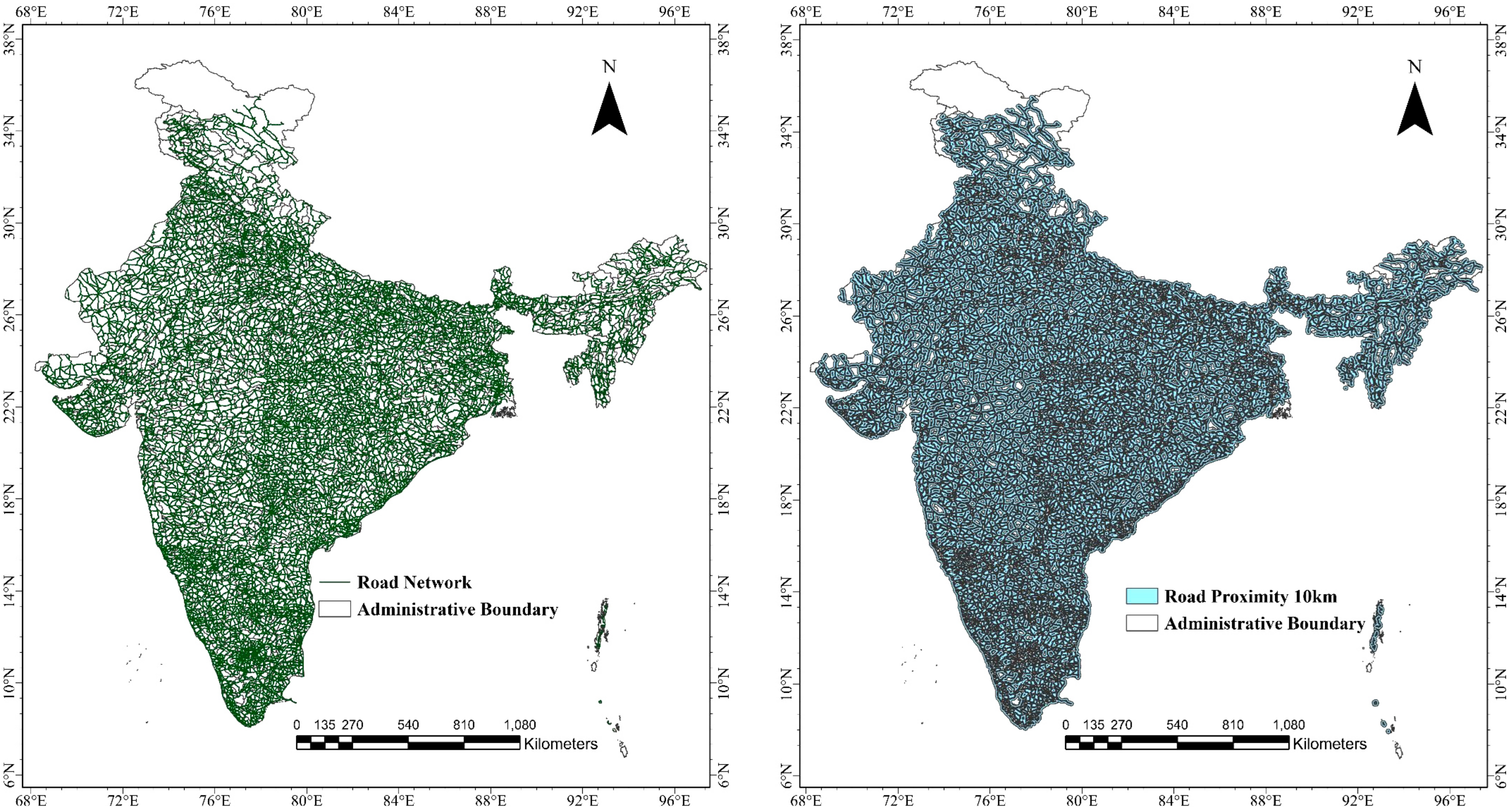


Figure 7. Indian road network and its proximity of 10 km, excluding the 2 km for future scope of expansion.

Similarly, the proximity to electrical substations is assessed to ensure the feasibility of connecting to the power grid based on the OSM data. Proximity to substations is critical for efficient power transmission, and for this assessment, the substation proximity is considered at 10 km. Being close to substations reduces the need for extensive and costly transmission infrastructure, minimises transmission losses, and ensures a stable connection to the grid. This proximity also facilitates the integration of solar-generated electricity into the existing power network, making it a practical and economically viable option for solar energy projects. The proximity map of the substations is shown in Figure 8.

This analysis provides critical insights into optimal locations for solar panel installations based on infrastructure considerations. By leveraging this combined approach, the study aims to identify and prioritise locations that not only maximise solar energy potential (GHI, Slope and Aspect) but also minimise logistical challenges and ensure proximity to necessary infrastructure. The combined map can serve as a valuable tool for decision-making, facilitating sustainable development practices while optimising resource utilisation and environmental impact mitigation.

4.3.3 Waterbody evaluation

In the floating solar potential study, the evaluation of suitable water bodies primarily focuses on hydro lakes, identified using data extracted from the HydroSHEDS database[29]. HydroSHEDS is an open-source and globally recognised dataset that provides comprehensive hydrographic information, making it an authentic and reliable source for hydro-ecological research and applications worldwide. It offers a suite of global digital data layers, including catchment boundaries, river networks, and lakes, at multiple resolutions and scales. Specifically, the hydro lakes dataset, derived from HydroSHEDS, provides detailed shoreline polygons of global lakes with a surface area of at least 10 hectares. Hydro lakes have been developed using a range of auxiliary data sources, including lake polygons and gridded lake surface areas. The utilisation of HydroSHEDS and hydro lakes ensures that the study is based on high-quality, consistent, and verifiable data, aiding in the accurate identification of potential sites for floating solar projects.

4.3.4 Water availability evaluation

Another crucial parameter in the floating solar potential study is water availability (seasonality), which is assessed using data from high-resolution mapping of global surface water and its long-term changes. This dataset[30] provides valuable insights into the spatial and temporal dynamics of surface water across the globe, making it an essential resource for evaluating the sustainability and consistency of water availability for floating solar installations. The dataset offers detailed information on surface water extent, seasonality, and recurrence, enabling researchers to assess the potential risks associated with water level fluctuations over time. For this analysis, the seasonality of water availability is considered to be greater than 11 months, ensuring that selected sites have consistent water presence to support the long-term operation of floating solar projects. By utilising this high-resolution global surface water dataset, the study ensures a comprehensive understanding of water availability, contributing to more accurate site selection and long-term viability assessments for floating solar projects.

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[29] Messager, M. L., Lehner, B., Grill, G., Nedeva, I., & Schmitt, O. (2016). Estimating the volume and age of water stored in global lakes using a geo-statistical approach. Nature communications, 7(1), 13603.

[30] Pekel, J. F., Cottam, A., Gorelick, N., & Belward, A. S. (2016). High-resolution mapping of global surface water and its long-term changes. Nature, 540(7633), 418-422.

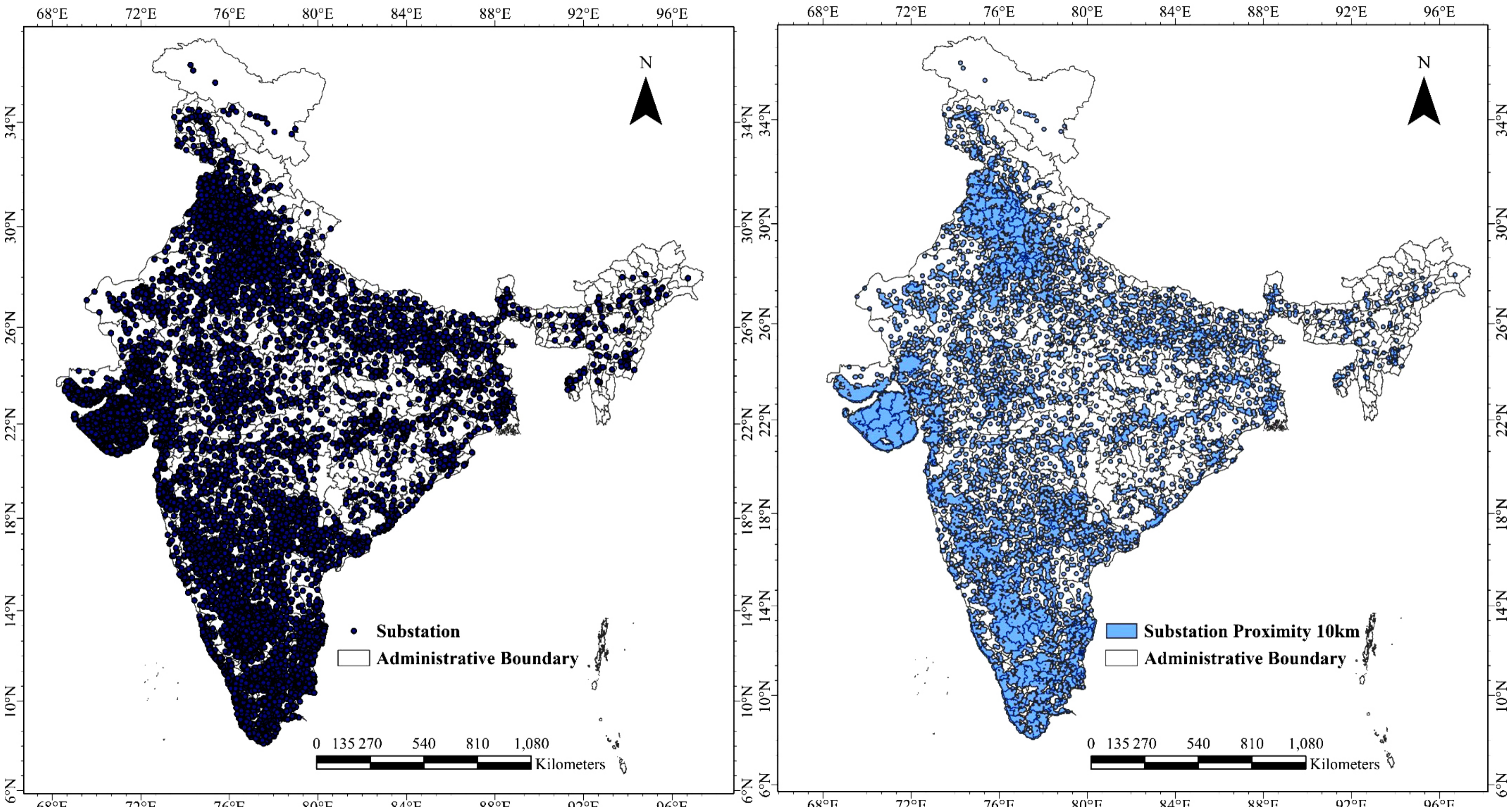

Figure 8.Indian substation network and its proximity of 10 km

4.3.5 Bathymetry evaluation

The bathymetry evaluation for the floating solar potential study is conducted using the GLOBathy dataset[31], which provides a comprehensive global bathymetric dataset for over 1.4 million waterbodies. GLOBathy aligns with the well-established hydro lakes dataset and offers detailed bathymetric maps based on maximum depth estimates and geometric/geophysical attributes of waterbodies. For this analysis, water bodies with depths ranging between 3 to 30 meters are considered, ensuring suitable conditions for floating solar deployment while accounting for stability and anchoring requirements. The integration of the GLOBathy dataset enables a precise assessment of bathymetric characteristics, supporting the identification of viable floating solar project sites.

4.4 Feasibility assessment

The feasibility assessment integrates all previously discussed evaluation criteria of waterbodies, seasonality, bathymetry, solar irradiance and infrastructural proximity, to determine the overall viability of potential solar sites. The process involves the following steps:

Parameter	**Assessment Criteria**
Waterbodies	Identify hydro lakes and waterbodies for the assessment
Seasonality	Determine waterbodies with around-the-year water availability
Bathymetry	Identify suitable water bodies with depths ranging between 3 to 30 meters
GHI	Assess regions that meet the minimum GHI threshold of 4.5 kWh/m²/day
Road	Find regions within a 10 km proximity to road networks, excluding the buffer of 2 km for th future scope of expansion
Substation	Find regions with a proximity of 10 km to substations

If a region meets all these criteria, it is deemed feasible for floating solar potential. Conversely, if any criterion is not met, the region is considered unsuitable. The methodology for the same has been explained using the case study of the Hirakud reservoir.

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[31] Khazaei, B., Read, L. K., Casali, M., Sampson, K. M., & Yates, D. N. (2022). GLOBathy, the global lakes bathymetry dataset. Scientific Data, 9(1), 36.

4.4.1 Floating solar water body feasible area estimation

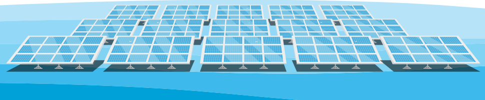
Due to the limited visibility of hydro lakes on the Indian map, the methodology for evaluating the floating solar potential has been demonstrated using the Hirakud Reservoir as a representative case study. A systematic geospatial analysis was undertaken to identify feasible areas for photovoltaic (PV) installation. The assessment commenced with the selection of the Hirakud Reservoir from hydrological datasets, delineating its spatial extent to serve as the analytical foundation, as illustrated in Figure 9. Subsequently, a temporal analysis of water availability was conducted by processing 12 months of seasonality data derived from the Global Surface Water (GSW) dataset, ensuring year-round water presence within the reservoir, as depicted in Figure 10.

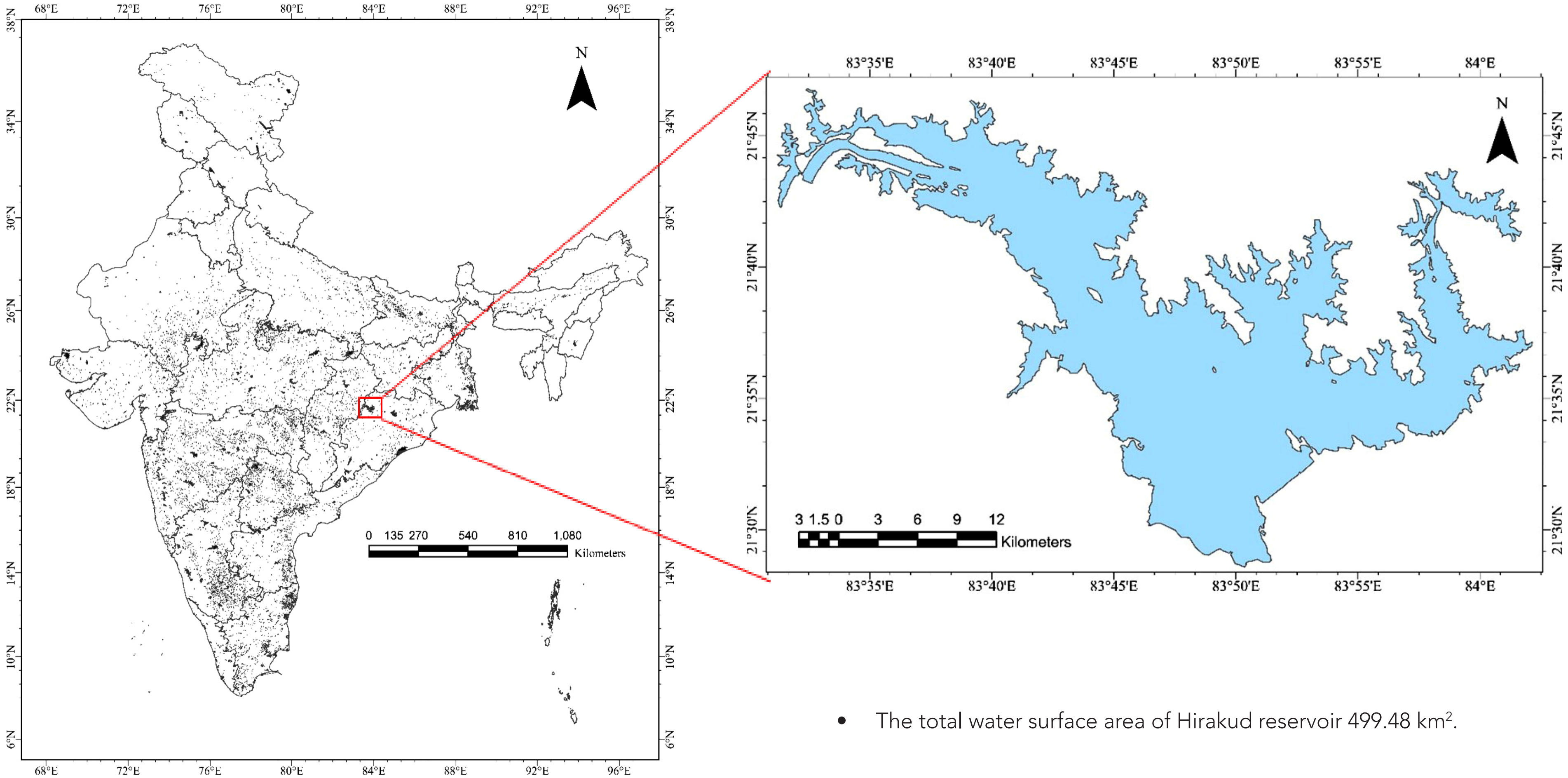
Following this hydrological assessment, bathymetric data obtained from the GLOBathy dataset were integrated to determine water depths ranging from 3 to 30 meters, which are considered optimal for the deployment of floating solar systems, as shown in Figure 11. Areas with depths shallower than 3 meters were excluded to mitigate risks related to structural stability, while regions exceeding 30 meters were disregarded due to complexities associated with anchoring and cost implications. Combining the given parameters encompassing Hydrolake, Seasonality, and Bathymetry, the feasible sites for the floating solar are identified and are shown in Figure 12. This multi-criteria assessment ensured the selection of areas that are technically feasible, economically viable, and environmentally sustainable for floating PV installations. The comprehensive methodology, encompassing Hydrolake, Seasonality, and Bathymetry parameters, facilitated a robust and data-driven identification of potential deployment zones.

The analysis of the Hirakud Reservoir revealed that out of the total water surface area of 499.48 km2, approximately 317.03 km2 met the defined criteria for year-round water availability, as shown in Figure 10. Furthermore, bathymetric analysis of the reservoir reveals that nearly 292.65 km^2 of this area has a depth ranging between 3 and 30 meters, as shown in Figure 11.

Upon incorporating a bathymetry criterion, along with the seasonality, the feasible area is further reduced to 204.54 km^2, as shown in Figure 12. The feasible area includes only those regions where both water presence for 11-12 months and appropriate depth (3-30 m) overlap.

After identifying the seasonality of the reservoir over 11 to 12 months, the bathymetry (depth) ranged from 3 to 30 meters, and its proximity to roads was 10 km, the feasible area found was around 187.91 km^2 for solar PV installation, as shown in Figure 13. Upon further incorporating grid connectivity constraints, specifically proximity of 10 km to substations, the optimally suitable and feasible area is reduced to 99.50 km^2, representing the final delineated extent for potential installation.





- The total water surface area of Hirakud reservoir 499.48 km^2.

Figure 9. Hirakud Reservoir from the hydrological datasets

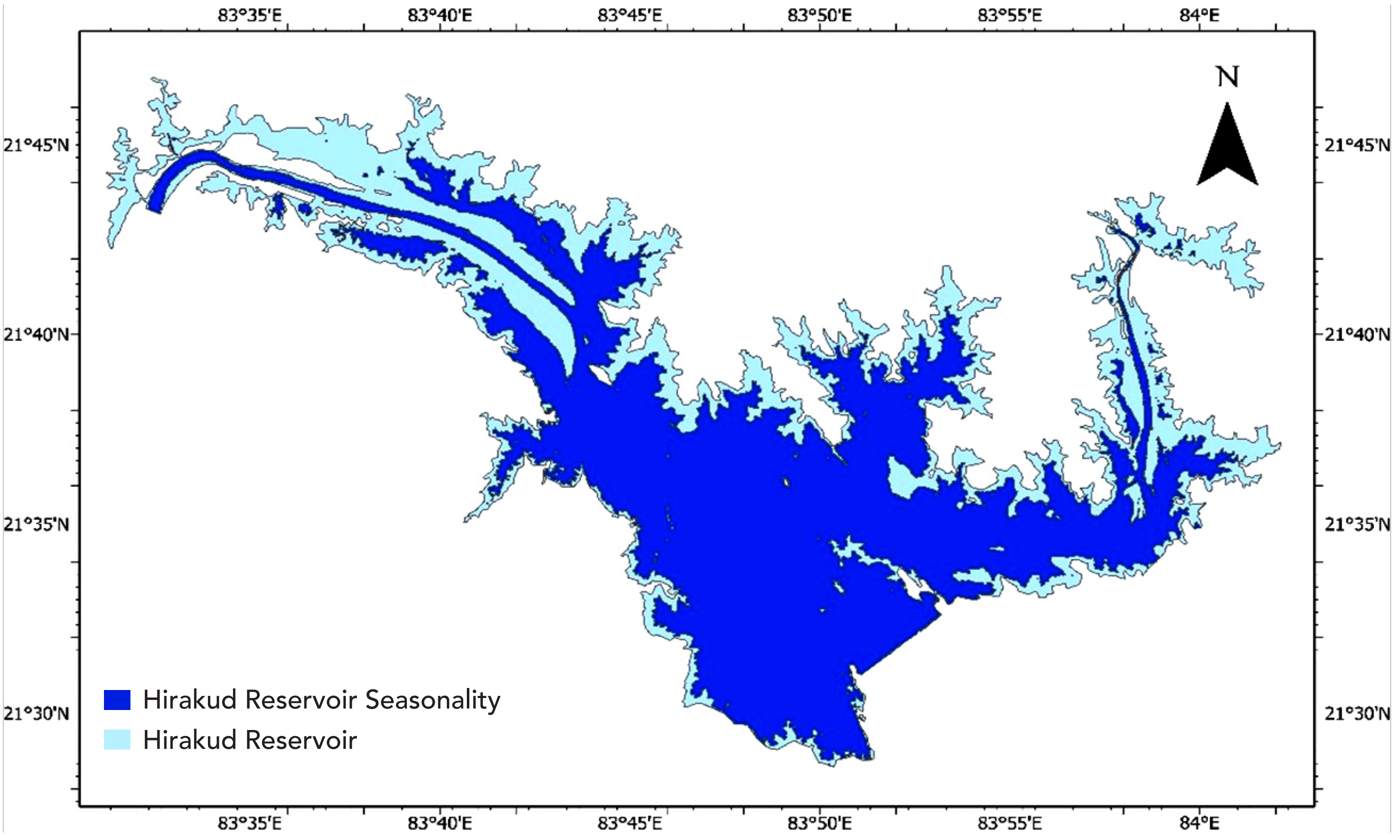


Figure 10. Graphical presentation of seasonality of the Hirakud reservoir

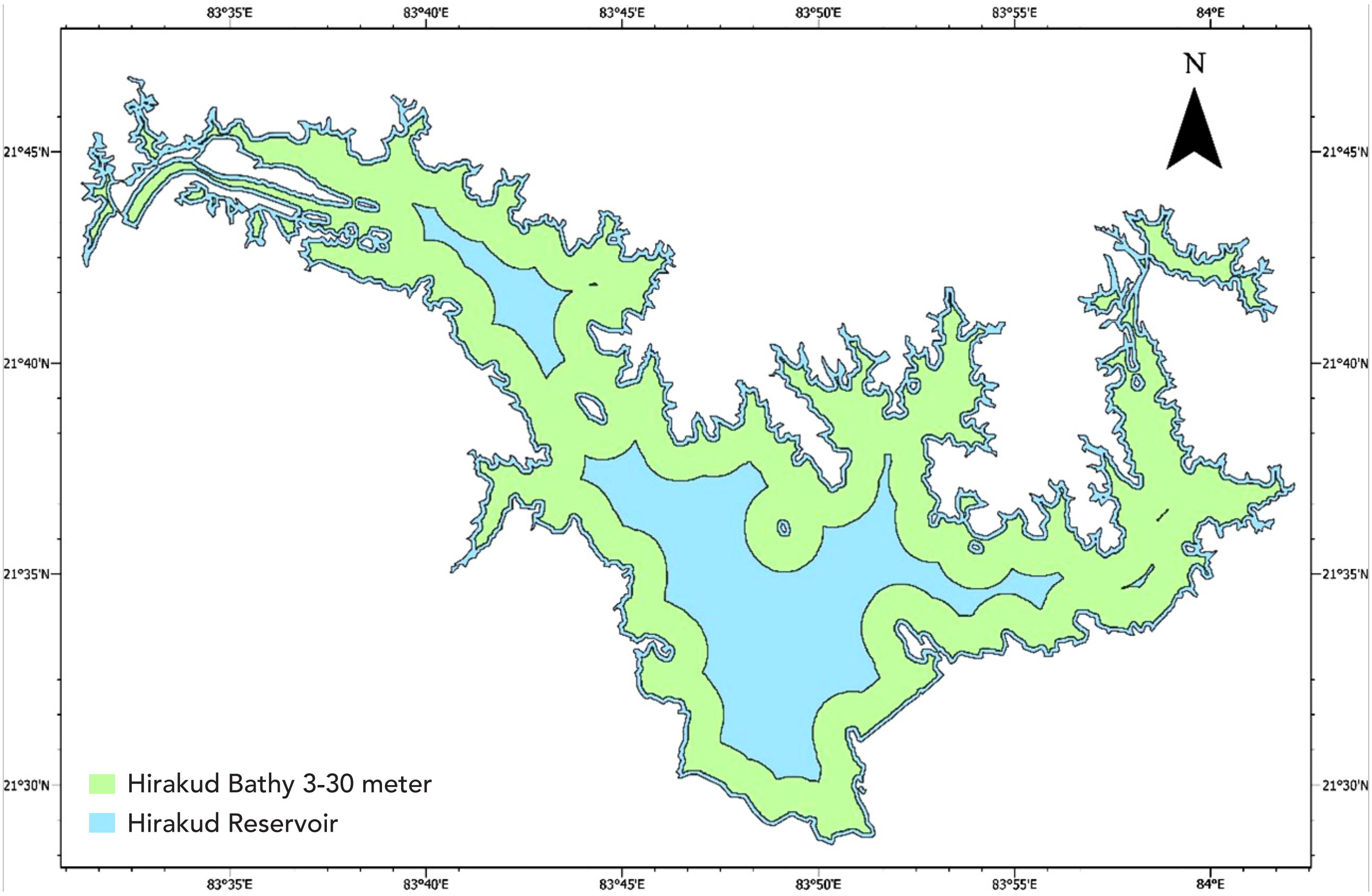


Figure 11. Graphical presentation of the bathymetry (depth) of Hirakud reservoir

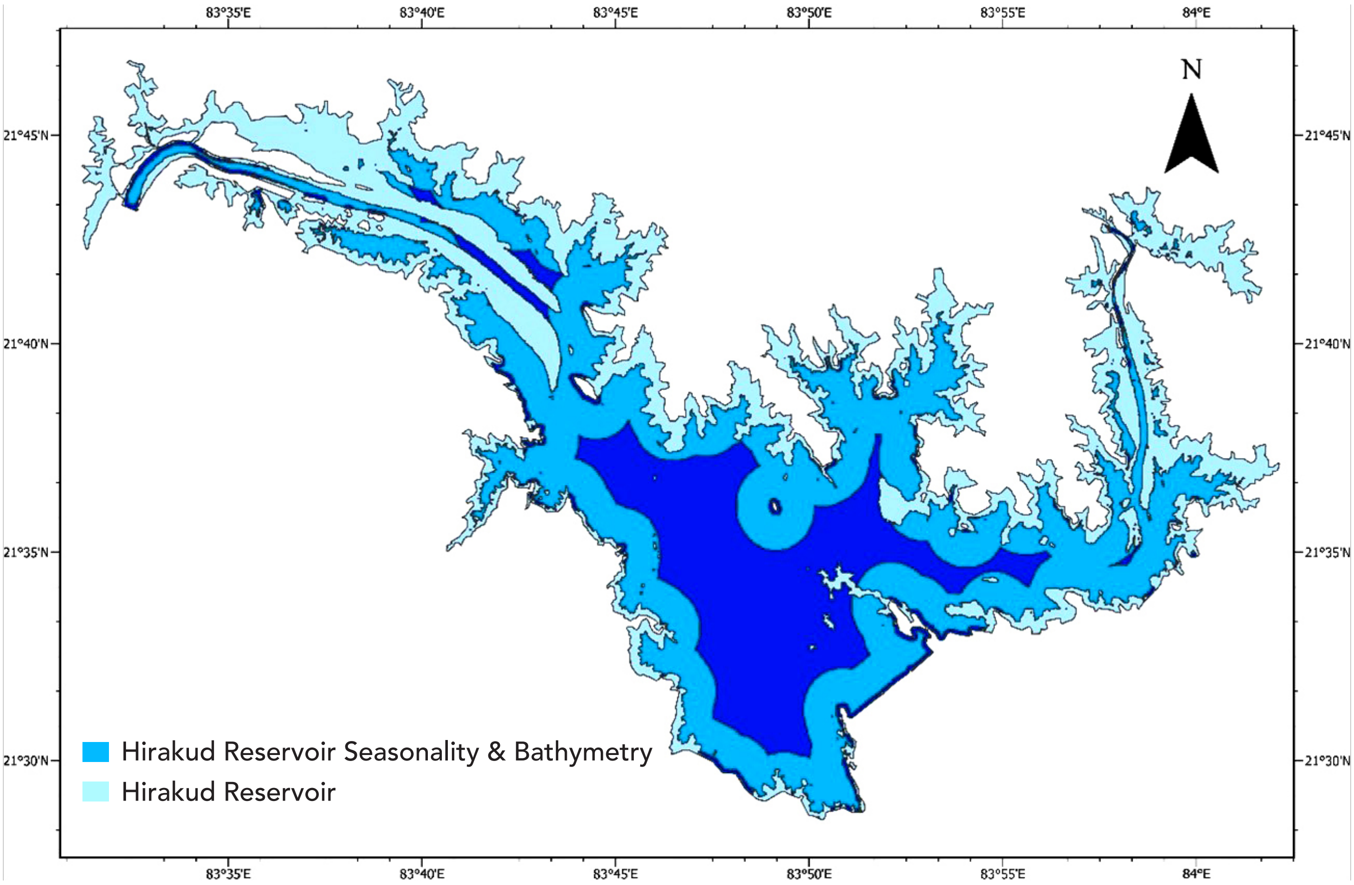


Figure 12. Graphical presentation of seasonality and bathymetry (depth) of Hirakud reservoir

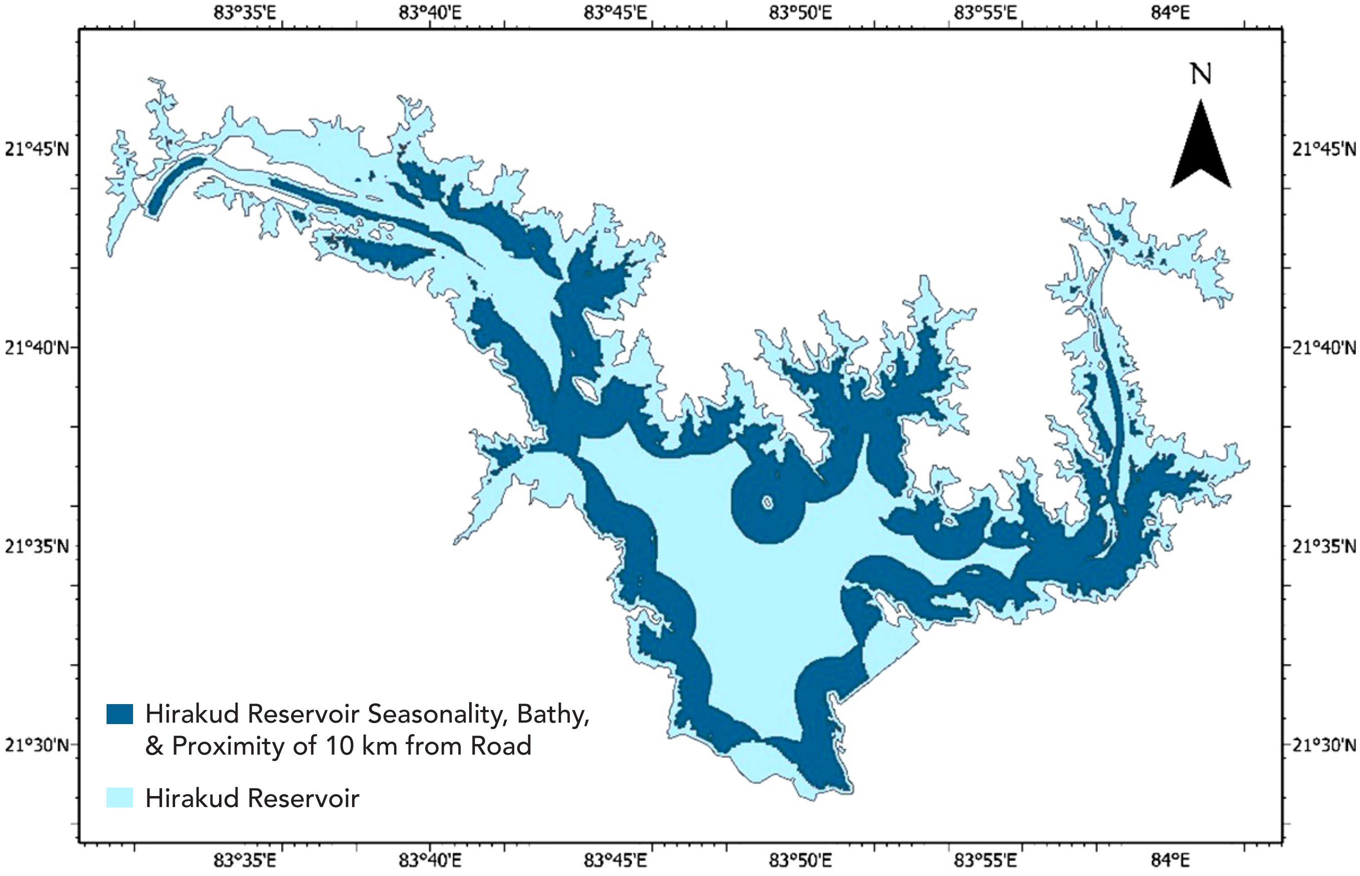


Figure 13. Graphical presentation of seasonality, bathymetry and a proximity of 10 km from the road to the Hirakud reservoir

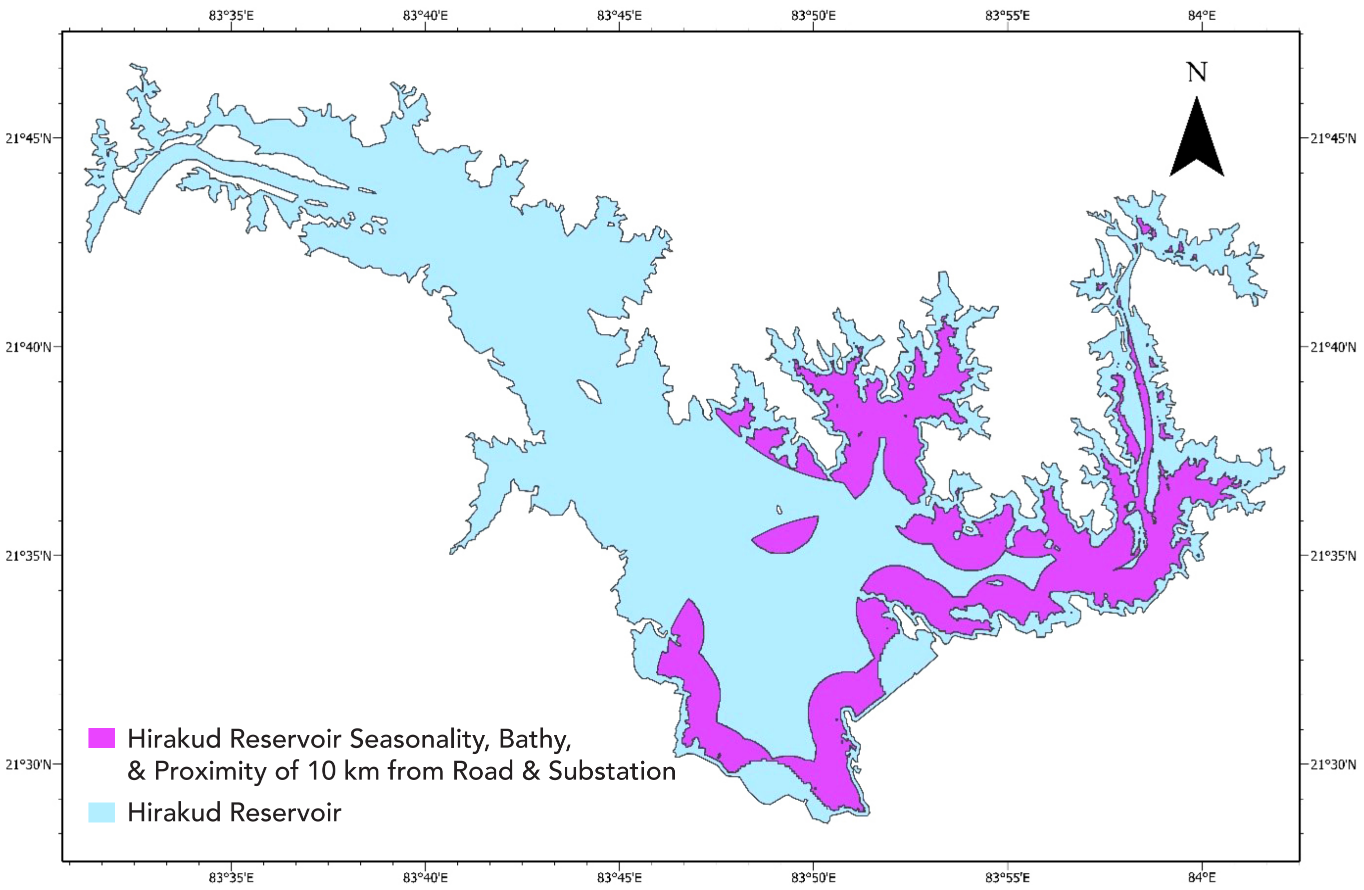


Figure 14. Feasible sites of Hirakud reservoir for Floating PV installation

4.5 Results and Discussion

After identifying all feasible regions for floating solar installations, this assessment considers technological parameters such as module wattage (545 Wp), module efficiency (21%), and module area (2.6 m^2). Additionally, a 5° tilt has been adopted for the solar panel installation. Taking all these factors under consideration, the water body area required for per MW installation is 0.019 km2. Based on the analysis, the state-wise floating solar potential of India is shown in Table 6. Adopting the same methodology for all other state reservoirs, the feasibility analysis yielded a total floating solar PV potential of 102.18 GWp across India, derived from a feasible reservoir area of 1,946.24 km2, which represents approximately 18.15 % of the total identified reservoir (10,725.99 sq. km). This is in line with the imposed constraint that no more than 20% of the reservoir area of the state is to be utilised for solar deployment.

National Landscape and Regional Trends – Floating Solar Potential

India's floating solar potential exhibits clear regional variations driven primarily by the availability and size of reservoirs, hydrological infrastructure, and the extent of feasible reservoir surface that can be utilised for solar deployment.

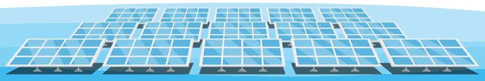
- Western and Central India emerge as the leading contributors, with Maharashtra (16.28 GWp) and Madhya Pradesh (14.89 GWp) together accounting for around 38% of the national potential. Their large multipurpose reservoirs and extensive irrigation infrastructure enable significant floating solar deployment opportunities.

Table 6. State-wise floating solar potential

States	Water Body Area (km²)	Feasible Waterbody		Maximum 20% area utilisation	
		Area (km²)	Potential (GW_p)	Area (km²)	Potential (GW_p)
Andhra Pradesh	153.26	63.90	3.35	27.71	1.46
Assam	0.60	0.21	0.01	0.12	0.01
Bihar	23.53	5.82	0.31	4.47	0.23
Chandigarh	1.11	0.48	0.03	0.22	0.01
Chhattisgarh	262.48	154.96	8.14	52.01	2.73
Goa	16.03	6.15	0.32	3.21	0.17
Gujarat	619.74	246.39	12.94	120.34	6.32
Himachal Pradesh	284.52	38.96	2.05	37.97	1.99
Jammu & Kashmir	105.95	33.10	1.74	16.75	0.88
Jharkhand	270.11	116.42	6.11	53.50	2.81
Karnataka	1491.98	632.72	33.22	260.72	13.69
Kerala	219.02	109.19	5.73	42.29	2.22
Ladakh	37.36	31.45	1.65	7.47	0.39
Madhya Pradesh	1433.88	764.30	40.13	283.68	14.89
Maharashtra	1618.55	775.17	40.70	310.08	16.28
Manipur	58.17	19.96	1.05	11.63	0.61
Odisha	1221.16	590.57	31.00	244.05	12.81
Puducherry	5.67	0.85	0.04	0.85	0.04
Punjab	3.07	2.00	0.10	0.61	0.03
Rajasthan	332.08	207.92	10.92	63.94	3.36
Tamil Nadu	326.04	150.46	7.90	63.68	3.34
Telangana	1523.36	333.95	17.53	204.15	10.72
Uttar Pradesh	552.88	198.50	10.42	107.40	5.64
Uttarakhand	89.98	33.84	1.78	14.67	0.77
West Bengal	75.46	28.74	1.51	14.69	0.77
Total	**10725.99**	**4546.01**	**238.66**	**1946.24**	**102.18**

- Southern and Eastern states demonstrate strong potential, particularly Karnataka (13.69 GWp) and Odisha (12.81 GWp), followed by Telangana (10.72 GWp). These states benefit from a high density of medium-to-large reservoirs associated with irrigation and hydropower projects.
- Moderate potential is observed in states such as Gujarat (6.32 GWp), Rajasthan (3.36 GWp), Tamil Nadu (3.34 GWp), Jharkhand (2.81 GWp), Chhattisgarh (2.73 GWp), and Kerala (2.22 GWp), where reservoir availability supports floating solar development but at relatively smaller scales compared to the leading states.
- Northern and Himalayan regions, including exhibit comparatively lower potential despite the presence of reservoirs, primarily due to terrain constraints, smaller feasible reservoir surface areas, and environmental considerations.
- Northeast states and smaller administrative regions contribute only marginally to the national potential owing to limited reservoir surface area and smaller water bodies suitable for floating solar installations.

Overall, the assessment indicates that India possesses a substantial floating solar potential of about 102.18 GWp, distributed across a wide range of states with varying hydrological and geographical conditions. The detailed waterbody level floating potential is attached in **Annexure I**. The results highlight that large reservoirs and inland water bodies in states such as Maharashtra, Madhya Pradesh, Karnataka, Odisha, and Telangana offer particularly high deployment potential, reflecting the availability of extensive, technically suitable water surfaces. By considering technological assumptions and excluding small and shallow water bodies, the analysis ensures that the estimated potential is realistic and implementable at scale. These findings underscore floating solar as a promising complementary pathway to ground-mounted solar, with the added benefits of efficient land use, reduced evaporation losses, and improved system performance, thereby strengthening India's overall renewable energy transition strategy.



4.6 Summary

India's floating solar potential assessment adopts a rigorous, multi-parameter geospatial methodology that goes well beyond a simple surface-area calculation. Six critical parameters water body characteristics, seasonal water availability (minimum 11 months), bathymetry (3–30 metre depth), Global Horizontal Irradiance (above 4.5 kWh/m²/day), road proximity (within 10 km), and substation proximity (within 10 km) are systematically applied to filter technically viable sites from India's total inland water body inventory. High-quality datasets including HydroLakes, Global Surface Water, GLO-Bathy, OpenStreetMap, and Global Solar Atlas underpin the analysis, ensuring that the assessed potential is grounded in verifiable, globally recognised data sources. The methodology is demonstrated through the Hirakud Reservoir case study, where successive application of each parameter progressively narrows the feasible area from 499.48 km² of total water surface to a final 99.50 km² of optimally suitable area, illustrating how the layered approach filters out unsuitable sites and delivers a deployment-realistic estimate.

Applying this methodology uniformly across all states, and constraining utilisation to a maximum of 20% of feasible reservoir area, India's total floating solar potential is assessed at 102.18 GWp across a feasible area of 1,946.24 km² approximately 18.15% of the total identified reservoir area of 10,725.99 km². Maharashtra (16.28 GWp) and Madhya Pradesh (14.89 GWp) emerge as the leading contributors, together accounting for nearly 31% of national potential, followed closely by Karnataka (13.69 GWp), Odisha (12.81 GWp), and Telangana (10.72 GWp). The geographic distribution reflects the density and scale of multipurpose irrigation and hydropower reservoirs across western, central, southern, and eastern India. The findings firmly position floating solar as a credible, large-scale complement to ground-mounted solar offering the added advantages of land conservation, reduced reservoir evaporation, and enhanced system performance through the natural cooling effect of water surfaces.

Benefits and Challenges of Floating Solar PV in India

Benefits and Challenges of Floating Solar PV in India

FSPV is increasingly recognised as one of the most promising frontiers in India's renewable energy expansion, primarily due to its ability to unlock energy generation capacity without competing for land. India's large reservoir network, coupled with its aggressive clean energy targets, makes FSPV especially relevant. Insights from global literature and the extensive case study of the Omkareshwar Floating Solar Park offer a nuanced picture of both the opportunities and the challenges associated with large-scale FSPV deployment.

This chapter presents an integrated assessment of the key benefits and constraints of FSPV for enabling its sustainable growth in India.

5.1 Benefits of FSPV Installation

5.1.1 Benefits of FSPV systems

Floating Solar PV plants offer a number of benefits as reported by several studies, which makes them an attractive and promising renewable energy solution as compared to ground-based installations. Some of the reported benefits of FSPV systems are as follows:

i. **Higher gains in energy production:** The ambient temperature in the vicinity of a waterbody is generally lower than the ambient temperature on land surface, and wind speed tends to be higher over open water surfaces as compared to on land. This results in lower operating temperatures of the PV cell, which in turn improves the energy yield,[32, 33]. The improvement of as much as by 10% as, compared with land-based PV systems, has been reported, [34, 35].

ii. **Land neutral:** Since FSPV plants are installed on water surfaces, the land requirement is none or greatly reduced as compared to ground-mounted solar PV plants, and hence FSPV is termed as land neutral. This is particularly important for the countries where land is scarce, and land acquisition creates hurdles for the deployment of solar PV projects[36].

iii. **Less soiling loss:** Since wind blowing over water surfaces contains less dust as compared to wind blowing over land, FSPV plants are subjected to less dust as compared to land-mounted solar PV installations.

iv. **Ease of cleaning:** In the case of FSPV plants deployed on inland waterbodies, water is readily available for cleaning purposes. However, the quality of the water needs to be checked and should be under the permissible limit[37].

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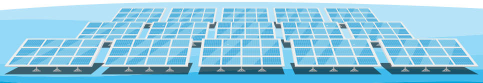

v. FSPV as a new source of revenue: Deploying FSPV plants can provide an additional source of revenue. For example, Jinko has installed a 120-MW FSPV-based plant on a fishing farm at Poyang Lake in China, spread over 2000 acres of water surface and generating 137.70 GWh of electricity[38].

vi. Possibility of sharing existing electrical infrastructure: Many inland waterbodies, especially reservoirs used for various purposes like irrigation, water supply, reservoirs of hydroelectric plants, etc., have grid connections that are already available. Hence, deploying FSPV plants in such cases may save investment cost by utilising the already existing infrastructure[39].

vii. Complementary operation with hydroelectric power plants: Since most of the hydroelectric power plants are seasonal, their output decreases particularly during dry seasons, thus deploying FSPV plants in combination with already existing hydroelectric power plants would not only improve power production in lean seasons but also act as energy storage, using solar power during the day and hydropower during the night.

viii. Installation and deployment: In general, installation of a typical FSPV plant is simpler and easy as compared to land-mounted solar PV plants, because of (a) no civil work is required to prepare the site, (b) floating platform used to float solar PV arrays (c) floating platforms are assembled on land by adding rows of these modular inter-connecting floats.

ix. Reduction in algae growth: Since FSPV plants provide shade to the water surface, they reduce the amount of sunlight reaching the water surface, which may cause a reduction in algae growth[40].

x. Reduction in water evaporation: Loss of water resources due to evaporation is a well-known phenomenon, reported as high as 40% worldwide[41], and its effect is significant, particularly in dry and arid regions. Since FSPV plants are deployed on the water surfaces, they provide shade to the water surfaces, which may result in a reduction in the water evaporation losses.

5.2 Challenges in FSPV deployment

While floating solar farms offer several benefits, they also face certain challenges that need to be addressed for successful implementation:

i. **Technology challenges:** FSPV technology faces several challenges that hinder its large-scale deployment, such as the unavailability of FSPV-specific standards and the unavailability of waterbody data.

ii. **Installation challenges:** The installation of FSPV systems presents several challenges clearances for FSPV projects and transportation of the floating platform, that must be addressed for smooth project execution.

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[38] Sahu, A., Yadav, N., & Sudhakar, K. (2016). Floating photovoltaic power plant: A review. Renewable and sustainable energy reviews, 66, 815-824. https://doi.org/10.1016/j.rser.2016.08.051.

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iii. Operation and maintenance challenges: Skilled divers are needed, which adds extra cost to O&M, and to cater to sudden faults, replacement of electrical parts, maintenance of cables and wires, etc., are complex things to handle and require special training for plant personnel.

iv. Higher initial cost: The upfront cost of installing a floating solar project can be higher than that of a ground-mounted system, due to the need for specialised structures and anchoring systems.

v. Impact on aquatic ecosystem: The shade created by floating solar panels can affect aquatic life in the area, decreasing the amount of sunlight reaching the water. This can have consequences on aquatic ecosystems, including the photosynthesis of aquatic plants and marine life.

vi. Mechanical instability and float dynamics: FSPV structures are constantly subject to hydrodynamic forces. Observations at Omkareshwar revealed:

- Loosening of inter-float joints
- Misalignment in platform sections
- Uneven buoyancy across float blocks

Such instability increases stress on modules, walkways, and cables, requiring more frequent inspections and structuraladjustments.

vii. Cable fatigue, abrasion, and electrical risks: Cable management in floating solar installations is inherently more complex due to the dynamic aquatic environment. Continuous movement of the floating structures, driven by wind and wave action, induces repeated bending and abrasion in the cables, increasing the risk of mechanical wear over time. Additionally, cable trays require periodic tension adjustments to accommodate fluctuations in water levels and structural displacement. Some of the developers have also reported instances of DC cable breakage, highlighting the need for robust design, protective measures, and regular maintenance to ensure system reliability.

5.3 Summary

FSPV systems represent a transformative approach to renewable energy deployment, particularly in regions where land availability is limited. By utilising underused water surfaces such as reservoirs, lakes, and canals, FSPV eliminates the need for land acquisition, avoiding conflicts with agriculture, forestry, and urban development. This land-neutral advantage makes FSPV highly suitable for densely populated countries like India, where competition for land is intense. A significant technical benefit of FSPV lies in its higher energy yield compared to ground-mounted systems. Solar panels mounted over water operate at lower temperatures due to the cooling effects of wind and water, which improves photovoltaic efficiency.

FSPV also contributes to water conservation by shading water bodies, thereby reducing evaporation by 30–60%. Large-scale projects demonstrate the impact of saving nearly 19.5 million cubic meters of water per year. These water savings are particularly critical in arid and semi-arid regions, supporting irrigation, hydropower generation, and drinking water supply. Integration with existing hydropower infrastructure is another key advantage. Reservoir-based FSPV projects can share grid infrastructure with hydropower plants, reducing capital expenditure and enabling hybrid operations. Solar generation during the day can be complemented by hydropower at night, enhancing grid stability and maximising renewable energy utilisation.

From an environmental perspective, FSPV can reduce algae growth and improve water quality, though shading may affect aquatic ecosystems by limiting photosynthesis. The long-term impact on fisheries, biodiversity, and water chemistry warrants careful study and ongoing monitoring. Economically, FSPV systems are currently approximately 25% more expensive upfront than land-based solar due to floating structures, anchoring, and waterproofing. However, higher efficiency, land savings, water conservation, reduced transmission costs, and hybrid integration improve long-term financial viability.

Way Forward

Way Forward

Building on the findings of this assessment, which highlight the scalability of floating solar and the importance of diversified deployment pathways, India's solar strategy should now move toward an integrated, multi-application framework. This involves scaling innovative PV applications, strengthening hybridisation approaches, and embedding geospatial potential assessments into planning processes. Key strategic directions include:

1. Development of a Dedicated Solar Potential Portal

To enable more informed, transparent, and actionable planning, NISE is committed to developing a dedicated Solar Potential Portal. This portal will:

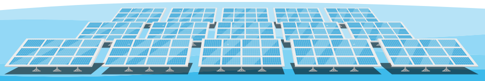
- Provide state- and district-level geospatial maps of feasible solar sites.
- Allow stakeholders to explore land suitability, irradiance, infrastructure proximity, and environmental constraints interactively.
- Serve as a knowledge-sharing platform linking policymakers, project developers, investors, and researchers.

2. Integration with National and State-Level Energy Planning

NISE's periodic assessments and portal-based data will be directly linked to national and state energy planning frameworks. This will enable:

- Prioritisation of high-potential zones for ultra-mega solar parks.
- Strategic allocation of resources for grid strengthening and infrastructure development.
- Alignment of solar deployment with India's Panchamrit targets, i.e. energy independence by 2047, and net-zero commitments by 2070.

Through a combination of continuous potential updates, a dedicated geospatial portal, and application-specific assessments, NISE aims to provide a scientific, transparent, and policy-relevant foundation for India's solar roadmap. This approach ensures that solar energy continues to drive the nation's clean energy transition, maximises resource efficiency, and reinforces India's position as a global leader in renewable energy innovation.



Annexure

Annexure: Waterbody wise FSPV Potential of India

ANDHRA PRADESH							
Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Abbireddypalli Lake	1396633	Kurnool	0.24	0.17	0.01	0.05	0.003
Bahuda Muhana Sagar	1393119	Srikakulam	0.25	0.14	0.01	0.05	0.003
Bhairivani Tippa Reservoir	15747	Anantapur	11.09	0.48	0.03	0.48	0.03
Bugga Dam Reservoir	15710	Guntur	10.51	6.61	0.35	2.10	0.11
Dharmavaram Water Tank	179035	Anantapur	2.59	0.59	0.03	0.52	0.03
Donkarayi Reservoir	15685	East Godavari	20.38	10.59	0.56	4.08	0.21
Dr. KS Penna Ahobilam Balancing Reservoir	178979	Anantapur	3.40	1.41	0.07	0.68	0.04
Guntawada Reservoir	178507	Visakhapatnam	7.30	2.36	0.12	1.46	0.08
Guntawada Reservoir	1394166	Visakhapatnam	0.45	0.27	0.01	0.09	0.005
Kandaleru Reservoir	15751	Potti Sriramulu Nellore	24.08	12.96	0.68	4.82	0.25
Koriagumpa Konda	178531	East Godavari	1.19	0.73	0.04	0.24	0.01
Kotaiah hill	178800	Guntur	2.54	1.18	0.06	0.51	0.03
Meghadri Gedda Reservoir	178549	Visakhapatnam	2.05	0.75	0.04	0.41	0.02
Mustikovila water reservoir	1397672	Anantapur	0.79	0.31	0.02	0.16	0.01
Narasimha Konda	179022	Potti Sriramulu Nellore	1.01	0.15	0.01	0.15	0.01
Peda Kancherla Cheruvu	178805	Guntur	1.61	0.46	0.02	0.32	0.02
Pichatur Dam	179237	Chittoor	1.19	0.38	0.02	0.24	0.01
Pond	1398150	Chittoor	0.57	0.13	0.01	0.11	0.01
Pond	1398247	Potti Sriramulu Nellore	0.31	0.11	0.01	0.06	0.003
Pulicat Lake	179132	Potti Sriramulu Nellore	2.19	1.10	0.06	0.44	0.02
Ramapuram lake	1398303	Chittoor	0.62	0.23	0.01	0.12	0.01
Reservior	1393925	Vizianagaram	0.73	0.21	0.01	0.15	0.01
sabari hills	178569	Visakhapatnam	3.05	1.59	0.08	0.61	0.03
Sarvepalli Reservoir	15753	Potti Sriramulu Nellore	10.41	0.94	0.05	0.94	0.05
Sprob Lake	179120	Potti Sriramulu Nellore	0.90	0.34	0.02	0.18	0.01
Sri Rama Giri	1396586	Prakasam	0.28	0.20	0.01	0.06	0.003
Tadipudi Reservoir	178489	Vizianagaram	7.99	3.50	0.18	1.60	0.08
Tambileru Project	178676	Krishna	1.91	0.78	0.04	0.38	0.02
Tank C	1398424	Chittoor	0.22	0.14	0.01	0.04	0.002

ANDHRA PRADESH							
Water Body Name	Hylake id	Majority District	Actual Area (km²)	Feasible Area (km²)	Potential (GW)	Feasible Area (km²) with 20% restriction	Potential (GW) with 20% restriction
Tatireddy Narasimha Reddy Dam	15744	Y S R Kadapa	12.26	5.34	0.28	2.45	0.13
Vankamaddi reservoir	1397805	Anantapur	0.28	0.14	0.01	0.06	0.003
Vedayapalem Backwaters	179024	Potti Sriramulu Nellore	6.92	2.67	0.14	1.38	0.07
Yerra Kaluva Reservoir	15704	West Godavari	12.24	6.27	0.33	2.45	0.13
YT Cheruvu	178928	Anantapur	1.71	0.65	0.03	0.34	0.02
Total						**27.71**	**1.46**

ASSAM							
Water Body Name	Hylake id	Majority District	Actual Area (km²)	Feasible Area (km²)	Potential (GW)	Feasible Area (km²) with 20% restriction	Potential (GW) with 20% restriction
Kalain PHE	1385477	Cachar	0.24	0.11	0.01	0.05	0.003
Lake	1385752	Hailakandi	0.37	0.10	0.01	0.07	0.004
Total						**0.12**	**0.01**

BIHAR							
Water Body Name	Hylake id	Majority District	Actual Area (km²)	Feasible Area (km²)	Potential (GW)	Feasible Area (km²) with 20% restriction	Potential with 20% restriction
Agricultural Land	177041	Bhagalpur	2.29	0.38	0.02	0.38	0.02
Hanuman Reservoir	177144	Banka	8.69	2.42	0.13	1.74	0.09
Lal Pahar	177165	Jamui	1.67	0.32	0.02	0.32	0.02
Mahadevpur Ghat_River Ganga	1384830	Bhagalpur	0.50	0.12	0.01	0.10	0.01
Phulwaria Dam	177242	Nawada	5.99	1.39	0.07	1.20	0.06
Pokhar Kanhaiya Chak	177048	Khagaria	2.52	0.97	0.05	0.50	0.03
Puranki Pokhar	176982	Samastipur	1.86	0.22	0.01	0.22	0.01
Total						**4.47**	**0.23**

CHANDIGARH							
Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Sukhna Lake	175869	Chandigarh	1.11	0.48	0.03	0.22	0.01
Total						**0.22**	**0.01**

CHHATTISGARH							
Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Alhanavagaon Dam	178028	Raj Nandgaon	2.65	1.32	0.07	0.53	0.03
Avijit Talab	178156	Dhamtari	1.66	0.33	0.02	0.33	0.02
Bango Reservoir	1497	Korba	103.53	68.95	3.62	20.71	1.09
Bordi Dam	178176	Balod	3.64	2.18	0.11	0.73	0.04
Darri Water Reservoir	177825	Korba	1.99	0.69	0.04	0.40	0.02
Ganrel Reservoir	15621	Dhamtari	79.22	48.49	2.55	15.84	0.83
Gondli Jalashay	15617	Balod	12.30	8.66	0.45	2.46	0.13
Jalso dam	1390767	Raipur	0.62	0.25	0.01	0.12	0.01
Jhanjh Lake	1391118	Raipur	0.32	0.14	0.01	0.06	0.003
Kelo River	1390241	Raigarh	0.39	0.14	0.01	0.08	0.004
Kharsia lake	1390222	Raigarh	0.56	0.11	0.01	0.11	0.01
Kumhari Tank	177999	Raipur	4.25	0.42	0.02	0.42	0.02
Mandir Hasaud Talaab	178032	Raipur	1.16	0.23	0.01	0.23	0.01
Maroda-2 Reservoir (BSP)	178042	Durg	2.08	0.91	0.05	0.42	0.02
Maroda-2 Reservoir (BSP)	178044	Durg	5.07	2.92	0.15	1.01	0.05
Maroda-2 Reservoir (BSP)	1391095	Durg	0.20	0.14	0.01	0.04	0.002
Mudhena Dam	178051	Raipur	5.79	2.21	0.12	1.16	0.06
PHE Dam	1388263	Korea	0.91	0.13	0.01	0.13	0.01
Pond 56	1391182	Raipur	0.37	0.12	0.01	0.07	0.004
Purenha Talab	1390374	Janjgir - Champa	0.64	0.18	0.01	0.13	0.01
Satrenga Dam	1389359	Korba	0.32	0.14	0.01	0.06	0.003
Sendh Lake	1391045	Raipur	0.66	0.21	0.01	0.13	0.01
Tandula Lake	15619	Balod	22.51	10.71	0.56	4.50	0.24

CHHATTISGARH

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Tandula Lake	15620	Balod	11.64	5.35	0.28	2.33	0.12
Total						**52.01**	**2.73**

GOA

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Salaulim Dam	15738	South Goa	14.28	5.45	0.29	2.86	0.15
Amtonem Lake	1396452	North Goa	0.40	0.15	0.01	0.08	0.004
Batim Lake	1396616	North Goa	0.48	0.21	0.01	0.10	0.01
Chorao Island	1396551	North Goa	0.71	0.24	0.01	0.14	0.01
Chorao Island	1396554	North Goa	0.17	0.11	0.01	0.03	0.002
Total						**3.21**	**0.17**

GUJARAT

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
AJI -3 DAM	177774	Rajkot	1.86	0.59	0.03	0.37	0.02
Ajwa Lake	177836	Vadodara	5.79	2.17	0.11	1.16	0.06
Akwada Creek	177963	Bhavnagar	3.57	1.59	0.08	0.71	0.04
Amli Dam	178015	Surat	2.04	0.22	0.01	0.22	0.01
Barbodhan Lake	1391075	Surat	0.58	0.21	0.01	0.12	0.01
Bhaarkaan Dam	177484	Kachchh	2.50	0.11	0.01	0.11	0.01
Bhadar Reservoir	15596	Rajkot	22.89	10.71	0.56	4.58	0.24
Chanch Island	178081	Amreli	1.64	0.70	0.04	0.33	0.02
Chanch Island	178082	Amreli	3.73	1.40	0.07	0.75	0.04
Chanch Island	178083	Amreli	3.37	1.57	0.08	0.67	0.04
Chanch Island	178085	Amreli	1.03	0.42	0.02	0.21	0.01
Chanch Island	178086	Amreli	5.47	2.10	0.11	1.09	0.06

GUJARAT							
Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Dhani Bet	177844	Devbhumi Dwarka	4.00	1.62	0.08	0.80	0.04
Dhareshwar Lake	178053	Amreli	1.04	0.21	0.01	0.21	0.01
Dholi Dam	177966	Bharuch	1.36	0.34	0.02	0.27	0.01
Doliyo Dungar	177948	Bhavnagar	2.73	1.04	0.05	0.55	0.03
Fire water	177820	Jamnagar	3.94	1.63	0.09	0.79	0.04
Fire water	1389654	Devbhumi Dwarka	0.22	0.15	0.01	0.04	0.002
Fofal Dam Reservoir	177942	Rajkot	2.54	0.83	0.04	0.51	0.03
Gam Talav	1390010	Botad	0.61	0.22	0.01	0.12	0.01
Goma Dam	1389919	Botad	0.44	0.13	0.01	0.09	0.005
Gopi Talav Theertham	177832	Devbhumi Dwarka	4.18	2.17	0.11	0.84	0.04
Indrasi Reservoir	177400	Sabar Kantha	2.21	0.44	0.02	0.44	0.02
Jafarabad Harbour	178111	Amreli	5.71	0.30	0.02	0.30	0.02
Jafarabad Harbour	1391487	Amreli	0.84	0.14	0.01	0.14	0.01
Jamrukhi Lake	177829	Devbhumi Dwarka	5.17	2.02	0.11	1.03	0.05
Kadana Reservoir	15545	Mahisagar	14.24	10.13	0.53	2.85	0.15
kakrapar Dam	15607	Tapi	18.21	1.99	0.10	1.99	0.10
Kalubhar River dam	1390350	Botad	0.68	0.23	0.01	0.14	0.01
Khengari Bet	177568	Kachchh	5.84	1.58	0.08	1.17	0.06
Khengari Bet	177580	Kachchh	8.07	3.27	0.17	1.61	0.08
Khodiyar Lake	178019	Amreli	2.20	0.71	0.04	0.44	0.02
Machchundri Dam	1391362	Junagadh	0.56	0.21	0.01	0.11	0.01
Machhan Reservoir	177560	Dahod	2.54	0.96	0.05	0.51	0.03
Machhu II Dam	177627	Morbi	1.26	0.62	0.03	0.25	0.01
Machu Dam 1	177796	Morbi	1.04	0.36	0.02	0.21	0.01
Madhuban Reservoir	15630	Valsad	37.89	15.47	0.81	7.58	0.40
Mazum Reservoir	177448	Aravalli	3.25	1.14	0.06	0.65	0.03
Meda Creek	177943	Porbandar	1.65	0.65	0.03	0.33	0.02

GUJARAT

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Meda Creek	1390372	Porbandar	0.68	0.13	0.01	0.13	0.01
Moj Dam	1390389	Rajkot	0.86	0.31	0.02	0.17	0.01
Moti Tank	1390446	Bhavnagar	0.76	0.15	0.01	0.15	0.01
Nara Dam	177419	Kachchh	2.28	0.82	0.04	0.46	0.02
Nava Talaw	1388332	Surendranagar	0.55	0.15	0.01	0.11	0.01
Nirona Dem	1387941	Kachchh	0.88	0.29	0.02	0.18	0.01
Panchmuli Lake	1390331	Narmada	0.27	0.11	0.01	0.05	0.003
Port-Road Lake	177956	Bhavnagar	3.76	2.23	0.12	0.75	0.04
Port-Road Lake	1390467	Bhavnagar	0.26	0.13	0.01	0.05	0.003
Pragsar	1388434	Kachchh	0.22	0.12	0.01	0.04	0.002
Ranghola	177957	Bhavnagar	1.05	0.29	0.02	0.21	0.01
Salaya Harbour	177851	Devbhumi Dwarka	2.21	0.75	0.04	0.44	0.02
Sardar Sarovar Dam Reservoir	177938	Narmada	1.26	0.74	0.04	0.25	0.01
Shakoor Lake	15518	Kachchh	19.86	14.06	0.74	3.97	0.21
Shetrunji	178005	Bhavnagar	8.93	5.32	0.28	1.79	0.09
Sodam Bandhara	178141	Gir Somnath	4.28	1.32	0.07	0.86	0.04
Sodam Bandhara	178147	Gir Somnath	4.42	0.39	0.02	0.39	0.02
Sukhbhadar Dam	177854	Surendranagar	2.34	0.57	0.03	0.47	0.02
Sundari lake	1388856	Morbi	0.99	0.27	0.01	0.20	0.01
Tappar Reservoir	177498	Kachchh	2.16	1.05	0.06	0.43	0.02
Ukai Reservoir	1504	Tapi	369.30	144.92	7.61	73.86	3.88
Vatrak Reservoir	177488	Aravalli	5.08	1.75	0.09	1.02	0.05
Water Tank	1391089	Surat	0.42	0.17	0.01	0.08	0.004
Total						**120.34**	**6.32**

HIMACHAL PRADESH

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Dakpathar Barrage	1378059	Sirmaur	0.37	0.14	0.01	0.07	0.004
Gobind Sagar	15194	Bilaspur	91.86	13.98	0.73	13.98	0.73
Maharana Pratap Sagar	1423	Kangra	189.27	23.31	1.22	23.31	1.22
Shah Nehar Barrage Lake	175408	Kangra	3.03	1.53	0.08	0.61	0.03
Total						**37.97**	**1.99**

JAMMU AND KASHMIR

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Dal Lake	15003	Srinagar	11.70	2.49	0.13	2.34	0.12
Dal Lake	174841	Srinagar	1.00	0.17	0.01	0.17	0.01
Manasbal Lake	174808	Bandipura	2.13	1.08	0.06	0.43	0.02
Ranjit Sagar Dam Lake	15105	Kathua	43.08	22.97	1.21	8.62	0.45
SKS Logboom -Project-1 Salal Dam	175039	Riasi	6.69	2.52	0.13	1.34	0.07
Wular Lake	14989	Bandipura	41.35	3.86	0.20	3.86	0.20
Total						**16.75**	**0.88**

JHARKHAND

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Baksha Dam serad	177303	Chatra	1.81	0.52	0.03	0.36	0.02
Cooling Pond 2	177398	Bokaro	3.25	1.59	0.08	0.65	0.03
Cooling Pond 2	177407	Bokaro	2.46	0.94	0.05	0.49	0.03
Dhurwa Dam	177491	Ranchi	4.14	1.21	0.06	0.83	0.04
Dimna Lake	177613	East Singhbhum	4.83	1.54	0.08	0.97	0.05

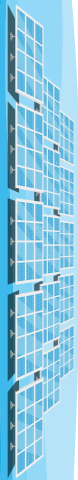
JHARKHAND

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Garga Dam	177422	Bokaro	2.31	0.83	0.04	0.46	0.02
Getalsud Dam	15541	Ranchi	16.86	9.15	0.48	3.37	0.18
Jamunia Reservoir	177510	Ranchi	1.98	0.10	0.01	0.10	0.01
Jogo Pahar (JAI SARNA)	177465	Ranchi	1.31	0.14	0.01	0.14	0.01
Konar Reservior	15526	Hazaribagh	17.75	10.47	0.55	3.55	0.19
Maithon Reservoir	15530	Jamtara	75.94	33.63	1.77	15.19	0.80
Masanjore Dam Reservoir	15520	Dumka	63.41	19.47	1.02	12.68	0.67
Patratu lake	177428	Ramgarh	8.23	5.05	0.27	1.65	0.09
pond	1386741	Hazaribagh	0.51	0.15	0.01	0.10	0.01
Sitarampur Reservoir	177624	Saraikela-Kharsawan	1.41	0.39	0.02	0.28	0.01
Tenughat Reservoir	15532	Bokaro	32.64	17.74	0.93	6.53	0.34
Tilaiya Dam Reservoir	15515	Hazaribagh	29.99	13.33	0.70	6.00	0.31
Udhwa Reservoir	177120	Sahibganj	1.29	0.15	0.01	0.15	0.01
Total						**53.50**	**2.81**

KARNATAKA

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Abbur Betta	179429	Ramanagaram	3.76	1.26	0.07	0.75	0.04
Amarja dam	178603	Kalaburagi	1.71	0.95	0.05	0.34	0.02
Anjanapura Reservoir	179074	Shivamogga	3.72	1.79	0.09	0.74	0.04
Arabian Sea	179017	Uttara Kannada	1.04	0.39	0.02	0.21	0.01
Arakera lake	178773	Raichur	3.34	1.20	0.06	0.67	0.04
Bannur Lake	179494	Mysuru	1.09	0.19	0.01	0.19	0.01
Basavakalyan Dam	178562	Bidar	2.18	0.41	0.02	0.41	0.02
Basavasagara Dam	15715	Vijayapura	90.08	62.21	3.27	18.02	0.95
Beach Side Property	1397541	Uttara Kannada	0.71	0.44	0.02	0.14	0.01

KARNATAKA							
Water Body Name	Hylake id	Majority District	Actual Area (km²)	Feasible Area (km²)	Potential (GW)	Feasible Area (km²) with 20% restriction	Potential (GW) with 20% restriction
Bennethora Reservoir	15691	Kalaburagi	11.55	7.60	0.40	2.31	0.12
Bhadra Reservoir	15761	Chikkamagaluru	97.03	51.83	2.72	19.41	1.02
Bhimaji Ganapathrao Kulkarani Field	1394892	Vijayapura	0.24	0.12	0.01	0.05	0.003
Bhogi hill	179046	Shivamogga	1.15	0.19	0.01	0.19	0.01
Bhoruka Reservoir	1396714	Koppal	0.69	0.22	0.01	0.14	0.01
Bommanahalli Reservoir	178925	Uttara Kannada	9.11	5.66	0.30	1.82	0.10
Bunder	179019	Uttara Kannada	1.02	0.31	0.02	0.20	0.01
Bunder	1397474	Uttara Kannada	0.83	0.38	0.02	0.17	0.01
Daroji Kere	178915	Ballari	5.66	3.10	0.16	1.13	0.06
Dasanakere	179371	Mandya	1.10	0.15	0.01	0.15	0.01
Devarabelekere Reservoir	179036	Davangere	5.02	1.26	0.07	1.00	0.05
Durgada Gudda	179140	Shivamogga	4.09	3.01	0.16	0.82	0.04
Galag lake	1395917	Raichur	0.23	0.11	0.01	0.05	0.002
Ganadhareshwara Hill	179456	Ramanagaram	1.03	0.23	0.01	0.21	0.01
Gayatri Jalashaya	179125	Chitradurga	2.96	0.39	0.02	0.39	0.02
Gorur Hemavathi Reservoir	15786	Hassan	44.33	24.60	1.29	8.87	0.47
Havina Betta	179465	Kodagu	4.76	3.29	0.17	0.95	0.05
Hemakuta Hill Temple	1396707	Koppal	0.38	0.24	0.01	0.08	0.004
Hemavati River	179407	Hassan	1.22	0.39	0.02	0.24	0.01
Hidkal Reservoir	15718	Belagavi	36.12	19.77	1.04	7.22	0.38
Hosagummi Kalibailu	1398664	Udupi	0.44	0.22	0.01	0.09	0.005
Huliyapura Reservoir	1396416	Koppal	0.79	0.11	0.01	0.11	0.01



KARNATAKA

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Kabini Reservoir	15804	Mysuru	51.19	33.93	1.78	10.24	0.54
Karanja Reservoir	15686	Bidar	16.98	6.23	0.33	3.40	0.18
Kodasalli Reservoir	178954	Uttara Kannada	6.87	2.90	0.15	1.37	0.07
Krishnaraja Sagara Reservoir	15797	Mysuru	79.25	40.20	2.11	15.85	0.83
Mallaghatta Kere	179337	Tumakuru	5.00	1.22	0.06	1.00	0.05
Mallayan Gudda	178778	Belagavi	3.05	0.82	0.04	0.61	0.03
Mandaragiri Hill	179275	Tumakuru	1.02	0.14	0.01	0.14	0.01
Mani Reservoir	15762	Shivamogga	31.73	15.65	0.82	6.35	0.33
Merched Kere	1395902	Raichur	0.82	0.27	0.01	0.16	0.01
Naqeeb Chulbul Land1	178621	Kalaburagi	1.42	0.90	0.05	0.28	0.01
Neera Sagar Reservoir	178904	Dharwad	3.07	0.61	0.03	0.61	0.03
Nirvana Hill	1397430	Uttara Kannada	0.75	0.47	0.02	0.15	0.01
Nirvana Hill	1397451	Uttara Kannada	0.36	0.19	0.01	0.07	0.004
Nonavinakere kere	1399180	Tumakuru	0.94	0.11	0.01	0.11	0.01
Nugu Reservoir	179553	Mysuru	4.89	3.58	0.19	0.98	0.05
Rabindranath Tagore Beach	1397154	Uttara Kannada	0.81	0.45	0.02	0.16	0.01
Rakaskop Dam	178847	Belagavi	2.39	1.06	0.06	0.48	0.03
Ramammankere	179440	Ramanagaram	1.56	0.12	0.01	0.12	0.01
Rangaiahnadurga Dam	178985	Chitradurga	2.68	0.50	0.03	0.50	0.03
Rani Lake	179047	Chitradurga	2.71	0.38	0.02	0.38	0.02
Renukasagar Reservoir	15720	Belagavi	74.87	31.28	1.64	14.97	0.79
Sangenahalli Lake	179032	Chitradurga	2.05	0.17	0.01	0.17	0.01
Savandurga Hill	179396	Ramanagaram	2.09	0.77	0.04	0.42	0.02
Savehaklu Reservoir	179129	Shivamogga	3.99	2.71	0.14	0.80	0.04

KARNATAKA							
Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Shanti Sagara	15756	Davangere	16.18	10.43	0.55	3.24	0.17
Sooley Kere	179462	Mandya	1.78	0.10	0.01	0.10	0.01
Sugarcane Farm	1521	Bagalkot	177.08	98.92	5.19	35.42	1.86
Sullyamale	1399611	Dakshina Kannada	0.81	0.24	0.01	0.16	0.01
Supa Dam Reservoir	15736	Uttara Kannada	89.39	42.75	2.24	17.88	0.94
Talakalale Balancing Reservoir	179069	Shivamogga	7.26	5.60	0.29	1.45	0.08
Talakalale Balancing Reservoir	1397706	Shivamogga	0.42	0.14	0.01	0.08	0.004
Taraka Reservoir	179545	Mysuru	1.63	1.33	0.07	0.33	0.02
Taripitada Gudda	1534	Shivamogga	140.52	77.66	4.08	28.10	1.48
Tattihallia Dam	178934	Uttara Kannada	5.85	2.25	0.12	1.17	0.06
Thippagondanahalli Reservoir	179378	Bengaluru Urban	5.21	0.71	0.04	0.71	0.04
Thulajankal Motte	179320	Chikkamagaluru	2.86	1.01	0.05	0.57	0.03
Tonnuru Kere	179455	Mandya	3.28	1.03	0.05	0.66	0.03
Tungabhadra	1526	Ballari	351.30	34.36	1.80	34.36	1.80
Vani Vilasa Sagara	15760	Chitradurga	39.15	13.46	0.71	7.83	0.41
Watehole Dam	179361	Hassan	3.34	1.13	0.06	0.67	0.04
Yadiyur	179386	Tumakuru	8.04	4.96	0.26	1.61	0.08
Total						**260.72**	**13.69**

KERALA							
Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Arabian Sea	179964	Thiruvananthapuram	2.14	1.55	0.08	0.43	0.02
Arabian Sea	1403533	Thiruvananthapuram	0.48	0.11	0.01	0.10	0.01

KERALA							
Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Ashtamudi Lake	15848	Kollam	12.31	6.65	0.35	2.46	0.13
Ashtamudi Lake	15850	Kollam	31.01	17.32	0.91	6.20	0.33
Chandiroor Puthenthode	1402582	Ernakulam	0.35	0.21	0.01	0.07	0.004
Ezhimala	1400810	Kannur	0.37	0.20	0.01	0.07	0.004
Gothuruth	15829	Trissur	10.10	5.61	0.29	2.02	0.11
Idamalayar	15828	Ernakulam	25.97	11.09	0.58	5.19	0.27
Ilaveezhapoonjira	179813	Idukki	1.32	0.51	0.03	0.26	0.01
Ilaveezhapoonjira	1402591	Idukki	0.79	0.12	0.01	0.12	0.01
Kadinamkulam Lake	179981	Thiruvananthapuram	2.58	1.01	0.05	0.52	0.03
Kadinamkulam Lake	1403589	Thiruvananthapuram	0.39	0.13	0.01	0.08	0.004
Kainakary Kizhakke Vattakkayal	1402845	Alappuzha	0.32	0.23	0.01	0.06	0.003
Kallenchery	179812	Ernakulam	2.33	0.89	0.05	0.47	0.02
Kallenchery	1402568	Ernakulam	0.50	0.26	0.01	0.10	0.01
Karingalichal Lake	179903	Alappuzha	1.23	0.20	0.01	0.20	0.01
Kayamkulam Kayal	1403123	Alappuzha	0.30	0.20	0.01	0.06	0.003
Kilikuthipara	179784	Ernakulam	1.23	0.12	0.01	0.12	0.01
Kizhakke Vattakkaayal	179849	Alappuzha	1.79	0.61	0.03	0.36	0.02
Kizhakke Vattakkaayal	1402829	Alappuzha	0.18	0.11	0.01	0.04	0.002
Kottisheri Hill	179645	Kozhikode	5.64	0.69	0.04	0.69	0.04
Kuthiathode	1402595	Alappuzha	0.44	0.30	0.02	0.09	0.005
Kuthiathode	1402598	Alappuzha	0.45	0.27	0.01	0.09	0.005
Kuttanad	1402971	Alappuzha	0.36	0.13	0.01	0.07	0.004
Kuttanad	1403013	Alappuzha	0.52	0.13	0.01	0.10	0.01
Malampuzha Dam	179714	Palakkad	7.53	4.87	0.26	1.51	0.08
Meenappally Kayal	1402813	Alappuzha	0.50	0.16	0.01	0.10	0.01

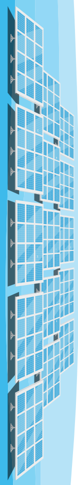
KERALA							
Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Meenkara Dam	1401926	Palakkad	0.87	0.40	0.02	0.17	0.01
Mullaperiyar Reservoir	15840	Idukki	14.27	9.20	0.48	2.85	0.15
Nakshathra Kunnu	15833	Idukki	38.92	26.70	1.40	7.78	0.41
Neyyar Dam	179998	Thiruvananthapuram	4.27	1.45	0.08	0.85	0.04
Pamba Malai	1402924	Pattanamthitta	0.95	0.23	0.01	0.19	0.01
Paravur Lake	179939	Kollam	3.92	2.35	0.12	0.78	0.04
Paravur Lake	1403372	Kollam	0.64	0.35	0.02	0.13	0.01
Payyanikotta	179605	Kozhikode	5.11	0.77	0.04	0.77	0.04
Pazhashi Dam Reservoir	179552	Kannur	4.14	0.24	0.01	0.24	0.01
Peppara Dam Reservoir	179982	Thiruvananthapuram	2.59	0.50	0.03	0.50	0.03
Ponmudi Reservoir	179806	Idukki	1.56	0.64	0.03	0.31	0.02
Poringalkuthu Reservoir	179772	Trissur	1.07	0.25	0.01	0.21	0.01
Purakkad	179617	Kozhikode	3.37	1.48	0.08	0.67	0.04
Subramanya Swamy Temple Tank	1400776	Kannur	0.23	0.11	0.01	0.05	0.002
Thanakulam	1403165	Kollam	0.52	0.24	0.01	0.10	0.01
Thenmala Reservoir	15849	Kollam	15.33	6.46	0.34	3.07	0.16
Thunakkadav Dam	179754	Palakkad	1.24	0.54	0.03	0.25	0.01
Thunakkadav Dam	179758	Palakkad	1.35	0.65	0.03	0.27	0.01
Valiyakulangara Devi Temple Pond	1403075	Alappuzha	0.53	0.15	0.01	0.11	0.01
Valiyakulangara Devi Temple Pond	1403085	Alappuzha	0.40	0.21	0.01	0.08	0.004
Varkala-Hariharapuaram lake-Kedakulam	179945	Kollam	2.49	1.24	0.07	0.50	0.03
Vattakayal reservoir	179923	Kollam	1.78	0.79	0.04	0.36	0.02
Vellayani Lake	180011	Thiruvananthapuram	2.00	0.45	0.02	0.40	0.02
Vembanad Lake	1402756	Kottayam	0.36	0.11	0.01	0.07	0.004
Total						**42.29**	**2.22**

LADAKH

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Spanggur Tso Lake	15029	Leh	37.36	31.45	1.65	7.47	0.39
Total						**7.47**	**0.39**

MADHYA PRADESH

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Amahi Lake	177257	Ashoknagar	1.95	0.67	0.04	0.39	0.02
Baihar Dam	1386788	Satna	0.65	0.16	0.01	0.13	0.01
Bansagar Lake	1488	Satna	383.38	241.37	12.67	76.68	4.03
Bargi Dam Reservoir	1496	Mandla	153.00	97.73	5.13	30.60	1.61
Benisagar Reservoir	177171	Chhatarpur	2.63	0.12	0.01	0.12	0.01
Birsagar Tal	177068	Nivari	2.34	0.18	0.01	0.18	0.01
Birsinghpur Reservoir	15544	Umaria	14.99	9.99	0.52	3.00	0.16
Budni Ghats	1389015	Sehore	0.82	0.11	0.01	0.11	0.01
Bundala Dam	177935	Betul	1.34	0.38	0.02	0.27	0.01
Chachai Lake	177534	Anuppur	2.43	1.23	0.06	0.49	0.03
Cheelar Dam	177469	Shajapur	3.95	1.30	0.07	0.79	0.04
Dahod Reservoir	177567	Raisen	3.65	0.97	0.05	0.73	0.04
Dammakhedi Lake	1387073	Mandsaur	0.66	0.28	0.01	0.13	0.01
Gambhir Dam	177516	Ujjain	2.01	0.26	0.01	0.26	0.01
Gandhi Sagar	1484	Mandsaur	522.37	276.53	14.52	104.47	5.48
Gopi sagar dam	177253	Guna	5.26	2.02	0.11	1.05	0.06
Halali Dam	15538	Bhopal	34.54	14.49	0.76	6.91	0.36
Hatayekheda lake	177494	Bhopal	2.10	0.18	0.01	0.18	0.01
Hatayekheda lake	1388231	Bhopal	0.91	0.47	0.02	0.18	0.01
Jamonia Dam	177506	Sehore	2.10	0.32	0.02	0.32	0.02
Jamuniya Dam	177947	Balaghat	1.48	0.19	0.01	0.19	0.01
Jata Shankar Tekri	1387324	Damoh	0.47	0.23	0.01	0.09	0.005



MADHYA PRADESH

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Kachan Dam	177324	Singrauli	2.57	0.43	0.02	0.43	0.02
Kaliasot Dam	177519	Bhopal	1.41	0.92	0.05	0.28	0.01
Kaliasot Dam	177535	Bhopal	1.97	0.61	0.03	0.39	0.02
Kanhergaon Dam	177911	Chhindwara	3.22	1.28	0.07	0.64	0.03
Khandari Lake	1388418	Jabalpur	0.65	0.24	0.01	0.13	0.01
Khusali Rundi	177695	Dhar	1.40	0.25	0.01	0.25	0.01
Kotwal Reservoir	176860	Morena	5.12	0.16	0.01	0.16	0.01
Lake	1388430	Sehore	0.81	0.10	0.01	0.10	0.01
Loni One B	1385064	Rewa	0.66	0.10	0.01	0.10	0.01
Matatila Dam Reservoir	15490	Shivpuri	65.47	29.85	1.57	13.09	0.69
Mehganv Dam	177559	Jabalpur	1.46	0.56	0.03	0.29	0.02
Nagchoon	1390348	East Nimar	0.92	0.36	0.02	0.18	0.01
Nagda Sagar	177415	Ujjain	3.46	0.51	0.03	0.51	0.03
Naren Dam	177348	Vidisha	2.89	0.80	0.04	0.58	0.03
Pali lake	1388013	Umaria	0.53	0.15	0.01	0.11	0.01
Pond	1386907	Singrauli	0.28	0.15	0.01	0.06	0.003
ranguwan dem	177209	Chhatarpur	8.32	2.40	0.13	1.66	0.09
Rankota	1389553	Indore	0.91	0.13	0.01	0.13	0.01
Ratapani Sanctuary Lake	177594	Raisen	1.89	0.56	0.03	0.38	0.02
Reservoir	177504	Shajapur	4.17	0.37	0.02	0.37	0.02
River Flow Dam	177468	Sehore	1.93	0.42	0.02	0.39	0.02
Satak reservoir	177904	West Nimar	1.96	0.81	0.04	0.39	0.02
Satoh Pahar	1387169	Vidisha	0.73	0.18	0.01	0.15	0.01
Sidhi Dam	1386617	Sidhi	0.99	0.42	0.02	0.20	0.01
Talab	1388234	Raisen	0.61	0.14	0.01	0.12	0.01
Tawa Reservoir	1498	Hoshangabad	101.35	40.56	2.13	20.27	1.06
Totladoh Dam and Reservoir	15600	Chhindwara	54.57	23.80	1.25	10.91	0.57
Upper Lake	15548	Bhopal	20.62	8.85	0.46	4.12	0.22
Total						**283.68**	**14.89**

MAHARASHTRA							
Water Body Name	Hylake id	Majority District	Actual Area (km²)	Feasible Area (km²)	Potential (GW)	Feasible Area (km²) with 20% restriction	Potential (GW) with 20% restriction
Adan Reservoir	178195	Washim	6.48	4.02	0.21	1.30	0.07
Ahmadpur Water reservoir	1393526	Latur	0.86	0.13	0.01	0.13	0.01
Akkalkot lake	1394699	Solapur	0.26	0.16	0.01	0.05	0.003
Amal-Nalla Damand Reservoir.	178294	Chandrapur	2.04	1.05	0.06	0.41	0.02
Amdori Dam,Spillway and Reservoir.	1391515	Amaravati	0.64	0.21	0.01	0.13	0.01
Anudha lake	1392725	Hingoli	0.26	0.10	0.01	0.05	0.003
Arali BK	1394372	Usmanabad	0.75	0.30	0.02	0.15	0.01
Arunawati Dam and Reservoir.	15633	Yavatmal	30.43	14.94	0.78	6.09	0.32
Ashta Talab	178542	Usmanabad	1.22	0.13	0.01	0.13	0.01
Aunde Pata	178285	Nashik	3.80	1.43	0.08	0.76	0.04
Avghada	1392990	Sub Urban Mumbai	0.90	0.57	0.03	0.18	0.01
Bahula Dam	178151	Jalgaon	1.09	0.42	0.02	0.22	0.01
Barvi Lake	15648	Thane	11.36	6.18	0.32	2.27	0.12
Bhatghar Dam	15679	Pune	22.86	10.21	0.54	4.57	0.24
Bhatsa Reservoir	15642	Thane	14.44	5.84	0.31	2.89	0.15
Bhavani Cha Mal	1392787	Hingoli	0.22	0.12	0.01	0.04	0.002
Bodalkasa Reservoir	178020	Gondia	3.25	0.40	0.02	0.40	0.02
Borgaon Dam , Spillway and Reservoir.	178185	Yavatmal	1.05	0.58	0.03	0.21	0.01
Borgaon Manju Reservoir and Spillway.	1391687	Akola	0.33	0.10	0.01	0.07	0.003
Bori	178536	Usmanabad	4.18	2.19	0.12	0.84	0.04
Borpada Dam	1391149	Nandurbar	0.87	0.36	0.02	0.17	0.01
Burai Dam	178045	Dhule	1.09	0.54	0.03	0.22	0.01
Chinchni Dam	15663	Ahamadnagar	22.63	7.70	0.40	4.53	0.24
Daunapur Dam	178377	Bid	3.49	1.62	0.08	0.70	0.04
Daund Lake	1393771	Pune	0.27	0.11	0.01	0.05	0.003

MAHARASHTRA							
Water Body N ame	Hylake id	Majority District	Actual Area (km²)	Feasible Area (km²)	Potential (GW)	Feasible Area (km²) with 20% restriction	Potential (GW) with 20% restriction
Dedor Gaon Talaw	1391590	Dhule	0.47	0.28	0.01	0.09	0.005
Deglur lake_1	1393584	Nanded	0.33	0.16	0.01	0.07	0.003
Devi Dahegaon Talav	1392781	Jalna	0.87	0.27	0.01	0.17	0.01
Devkund Waterfall	1393726	Raygad	0.65	0.38	0.02	0.13	0.01
Devkund Waterfall	1393734	Raygad	0.28	0.11	0.01	0.06	0.003
Dharur lake	178367	Bid	1.11	0.28	0.01	0.22	0.01
Doodhganga Sagar	15713	Kolhapur	20.93	13.01	0.68	4.19	0.22
Ekburji Dam Spillway and Reservoir	178243	Washim	1.26	0.45	0.02	0.25	0.01
Ekruk Lake	178557	Solapur	7.80	4.73	0.25	1.56	0.08
Erai	1392285	Chandrapur	0.46	0.14	0.01	0.09	0.005
Erai Dam, Spillway and Reservoir.	15632	Chandrapur	24.42	11.50	0.60	4.88	0.26
Gangapur Baandh Sagar	15634	Nashik	15.50	9.32	0.49	3.10	0.16
Garadgaon Reservoir .	1391691	Buldhana	0.51	0.14	0.01	0.10	0.01
Gavhan water Dam	1392885	Parbhani	0.54	0.23	0.01	0.11	0.01
Ghota Reservoir and Spill-way.	1391735	Akola	0.30	0.11	0.01	0.06	0.003
Himayatn lake	1392813	Nanded	0.74	0.18	0.01	0.15	0.01
Hingani Dam	178497	Solapur	4.17	1.82	0.10	0.83	0.04
Hinjewadi Hill	1393573	Pune	0.77	0.20	0.01	0.15	0.01
Hivra Dam	178160	Jalgaon	1.03	0.52	0.03	0.21	0.01
Hotigi Pazar Talav	1394566	Solapur	0.57	0.17	0.01	0.11	0.01
IIT Hill Top	178346	Sub Urban Mumbai	4.03	2.25	0.12	0.81	0.04
Jagirdars Lake	1392851	Nanded	0.27	0.10	0.01	0.05	0.003
Jakekur Dam	178538	Usmanabad	1.35	0.34	0.02	0.27	0.01
Jam Dam,Spillway and Reservoir.	178038	Nagpur	5.06	2.02	0.11	1.01	0.05
Jawalgaon Dam	178511	Solapur	4.99	3.38	0.18	1.00	0.05
Kailashgad	15668	Pune	30.44	23.20	1.22	6.09	0.32

MAHARASHTRA							
Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Kalmeshwar Dam,Spillway and Reservoir.	178217	Washim	1.01	0.13	0.01	0.13	0.01
Kanadi Reservoir and Spillway	1391731	Akola	0.31	0.10	0.01	0.06	0.003
Karnala	1393250	Raygad	0.87	0.28	0.01	0.17	0.01
kedarguda dam	178325	Nanded	1.22	0.39	0.02	0.24	0.01
Kekatpur dam,Spillway and Reservoir.	1391175	Amaravati	0.37	0.13	0.01	0.07	0.004
Kekatpur dam,Spillway and Reservoir.	1391189	Amaravati	0.26	0.10	0.01	0.05	0.003
Kekatpur dam,Spillway and Reservoir.	1391211	Amaravati	0.21	0.13	0.01	0.04	0.002
Khairi Dam	178418	Ahamadnagar	1.56	0.12	0.01	0.12	0.01
Khasapuri Dam	178468	Usmanabad	2.39	0.19	0.01	0.19	0.01
Khindsi Lake	15604	Nagpur	15.82	5.60	0.29	3.16	0.17
Kodri talab	1393326	Parbhani	0.45	0.10	0.01	0.09	0.005
Kolar Dam , Spillway and Reservoir.	178014	Nagpur	3.67	1.83	0.10	0.73	0.04
Kolkewadi Reservoir	178605	Ratnagiri	1.22	0.81	0.04	0.24	0.01
Kudla dam	1393130	Nanded	0.81	0.35	0.02	0.16	0.01
Kundalika Dam	178368	Bid	4.59	2.59	0.14	0.92	0.05
Kundalika River	178257	Jalna	1.35	0.14	0.01	0.14	0.01
Kurze Reservoir	178239	Palghar	3.09	1.68	0.09	0.62	0.03
Lake Arthur	178310	Ahamadnagar	9.47	4.51	0.24	1.89	0.10
Lake Beale	15637	Nashik	18.51	8.99	0.47	3.70	0.19
Lotus Lake	1392383	Palghar	0.71	0.19	0.01	0.14	0.01
Lower Pus Dam , Spillway and Reservoir.	178276	Yavatmal	8.97	1.70	0.09	1.70	0.09
Lower Wunna Dam	15614	Nagpur	27.06	13.22	0.69	5.41	0.28
Majalgaon Dam (Jayakwadi Phase II)	15650	Bid	46.44	25.79	1.35	9.29	0.49

MAHARASHTRA							
Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Mandala Laghu Talan	1392775	Jalna	0.72	0.19	0.01	0.14	0.01
Mangrul Dam	178022	Jalgaon	1.07	0.42	0.02	0.21	0.01
Manjara Dam	15666	Usmanabad	26.20	12.16	0.64	5.24	0.28
Manyad Reservoir	15660	Nanded	14.76	7.35	0.39	2.95	0.15
Marsul Dam,Spillway and Reservoir.	1392649	Yavatmal	0.29	0.12	0.01	0.06	0.003
Masuli Dam	178374	Parbhani	3.82	1.69	0.09	0.76	0.04
Matoba lake	178432	Pune	1.13	0.24	0.01	0.23	0.01
Mehrun Lake	1391356	Jalgaon	0.20	0.13	0.01	0.04	0.002
Mhasvad Tank	15690	Satara	10.37	2.53	0.13	2.07	0.11
Mogal Gad	178835	Kolhapur	1.61	0.73	0.04	0.32	0.02
Mohkhed Dam	1393233	Bid	0.93	0.23	0.01	0.19	0.01
Mordham Dam and Reservoir.	1391019	Nagpur	0.90	0.28	0.01	0.18	0.01
Morna Dam	178677	Sangli	1.39	0.14	0.01	0.14	0.01
Motsawanga Dam,Spillway and Reservoir.	1392093	Washim	0.48	0.11	0.01	0.10	0.01
Mukane Reservoir	15635	Nashik	13.01	6.06	0.32	2.60	0.14
Mula Dam	15644	Ahamadnagar	37.14	15.57	0.82	7.43	0.39
Nakane Lake	178104	Dhule	1.38	0.79	0.04	0.28	0.01
Nalganga Reservoir.	178144	Buldhana	3.90	1.43	0.08	0.78	0.04
Nashirabad Dam	1391364	Jalgaon	0.42	0.13	0.01	0.08	0.004
Nath Sagar	1507	Ahamadnagar	274.05	149.80	7.86	54.81	2.88
navaran Wadachi pati	178379	Bid	1.32	0.50	0.03	0.26	0.01
Nilona Dam,Spillway and Reservoir.	178206	Yavatmal	1.09	0.42	0.02	0.22	0.01
Palkhed Reservoir	178226	Nashik	1.56	0.66	0.03	0.31	0.02
Panchadhara Dam,Spillway and Reservoir.	178099	Wardha	1.01	0.57	0.03	0.20	0.01
Pandherbodi Dam & Reservoir.	178121	Nagpur	1.98	0.72	0.04	0.40	0.02

MAHARASHTRA							
Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Panshet Dam	15673	Pune	15.93	5.71	0.30	3.19	0.17
Panshet Dam	178454	Pune	9.96	3.69	0.19	1.99	0.10
Paradsinga Dam and Reservior.	1390905	Nagpur	0.22	0.10	0.01	0.04	0.002
Pen Lake	178398	Raygad	3.48	1.34	0.07	0.70	0.04
prashant r b	178663	Sangli	3.47	1.33	0.07	0.69	0.04
Pyramid Hill 1	178342	Pune	5.28	3.19	0.17	1.06	0.06
Radhanagari Dam Reservoir	15712	Kolhapur	10.26	4.54	0.24	2.05	0.11
Rawanwadi Dam and Reservoir	178068	Bhandara	1.97	0.19	0.01	0.19	0.01
Rotha - I , Dam and Reservoir.	1391609	Wardha	0.55	0.12	0.01	0.11	0.01
Saiki Dam , Spillway and Reservoir.	1391443	Nagpur	0.75	0.27	0.01	0.15	0.008
Saokhed Bhoi Reservoir.	1392315	Jalna	0.93	0.23	0.01	0.19	0.01
Sardar Sarovar Dam Reservoir	1500	Nandurbar	102.95	8.95	0.47	8.95	0.47
Selki Dam	1393832	Latur	0.71	0.12	0.01	0.12	0.01
Shetphal Haveli Irrigation Tank	178510	Pune	2.28	0.48	0.03	0.46	0.02
Shiravali Dam	1394430	Ratnagiri	0.49	0.25	0.01	0.10	0.01
Shirota	15661	Pune	10.08	7.45	0.39	2.02	0.11
Shirota	178391	Pune	3.05	1.53	0.08	0.61	0.03
Shirsuphal Lake	178460	Pune	2.01	0.42	0.02	0.40	0.02
Shivnibandh Lake	178076	Bhandara	2.01	0.99	0.05	0.40	0.02
Shivsagar Lake	15692	Satara	86.57	46.32	2.43	17.31	0.91
Sonvad Dam	178058	Dhule	1.93	0.40	0.02	0.39	0.02
Soygaon Dam	1391789	Aurangabad	0.27	0.18	0.01	0.05	0.003
Sukhana Dam	178277	Aurangabad	2.99	0.17	0.01	0.17	0.01

MAHARASHTRA							
Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Surabardi Dam and Reservoir.	1391096	Nagpur	0.45	0.12	0.01	0.09	0.005
Sutarvadi Reservoir	1393752	Raygad	0.71	0.19	0.01	0.14	0.01
Takali Dam,Spillway and Reservoir.	1391883	Yavatmal	0.42	0.15	0.01	0.08	0.004
Tansa Wildlife Sanctury	15641	Thane	13.59	7.93	0.42	2.72	0.14
Tapi River	15611	Jalgaon	11.72	3.26	0.17	2.34	0.12
tekdi	178444	Pune	7.17	5.20	0.27	1.43	0.08
Thokarwadi Dam	15659	Pune	17.38	11.50	0.60	3.48	0.18
Tung Fort	15664	Pune	18.03	12.45	0.65	3.61	0.19
Ujani Dam	1513	Solapur	219.20	110.44	5.80	43.84	2.30
Uma Reservoir and Spillway.	178159	Akola	2.42	0.80	0.04	0.48	0.03
Uma Reservoir and Spillway.	1391729	Akola	0.59	0.10	0.01	0.10	0.01
Upper Pus Dam,Spillway and Reservoir	178245	Yavatmal	7.19	4.06	0.21	1.44	0.08
Upper Vaitarna Reservoir	15636	Nashik	29.53	18.00	0.94	5.91	0.31
Upper Wardha Dam Reservoir .	15606	Amaravati	61.77	39.75	2.09	12.35	0.65
Varaladevi Talao	1392912	Thane	0.34	0.20	0.01	0.07	0.004
Vashi Holding Pond	15654	Thane	22.14	13.89	0.73	4.43	0.23
Veer Dam	15681	Satara	12.21	6.63	0.35	2.44	0.13
Vyphadpitesur Dam and Reservoir.	1391323	Nagpur	0.44	0.25	0.01	0.09	0.005
Warana Reservoir	15703	Sangli	23.65	14.69	0.77	4.73	0.25
Wena Dam and Resernoir	178050	Nagpur	4.30	1.55	0.08	0.86	0.05
Yeldari Dam and Reservoir.	15639	Hingoli	82.06	29.20	1.53	16.41	0.86
Zanzroli Lake	1392677	Palghar	0.38	0.12	0.01	0.08	0.004
Total						**310.08**	**16.28**

MANIPUR

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Loktak Lake	15510	Bishnupur	58.17	19.96	1.05	11.63	0.61
Total						**11.63**	**0.61**

ODISHA

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Badanallah Reservoir	178331	Rayagarha	6.08	2.18	0.11	1.22	0.06
Bahuda Muhana Sagar	178348	Ganjam	1.06	0.40	0.02	0.21	0.01
Balimela Reservoir	1512	Malkangiri	106.81	69.06	3.63	21.36	1.12
Bhaskel Resevoir	178291	Nabarangapur	4.28	1.37	0.07	0.86	0.04
Derjang Reservoir	178117	Anugul	6.03	2.28	0.12	1.21	0.06
Gupa Dangar Hill	178389	Koraput	1.61	0.61	0.03	0.32	0.02
Haladia Dam	177909	Mayurbhanj	1.52	0.13	0.01	0.13	0.01
Hirakud Reservoir	1502	Jharsuguda	499.48	204.54	10.74	99.90	5.24
Indravati Power Station Reservoir	1508	Kalahandi	105.55	61.54	3.23	21.11	1.11
Jolaput Reservoir	15670	Koraput	66.29	35.90	1.88	13.26	0.70
Kansbahal Dam	177890	Sundargarh	4.05	1.69	0.09	0.81	0.04
kolab Dam	15662	Koraput	62.58	37.80	1.98	12.52	0.66
Laxmi Dungri Hill	178000	Sambalpur	1.40	0.35	0.02	0.28	0.01
Laxmi Dungri Hill	178001	Sambalpur	2.32	0.71	0.04	0.46	0.02
Malia 1	1391939	Cuttack	0.44	0.11	0.01	0.09	0.005
Mandira Dam Reservoir	15583	Sundargarh	31.14	11.52	0.60	6.23	0.33
Mangalamandir Pond	1392076	Jagatsinghpur	0.57	0.27	0.01	0.11	0.01
Musa Ghati	177982	Keonjhar	4.72	2.80	0.15	0.94	0.05
Nagavali River	1392945	Rayagarha	0.28	0.11	0.01	0.06	0.003
Nimajhara MIP	178152	Jajapur	1.03	0.30	0.02	0.21	0.01
PitaMahal Dam	177887	Sundargarh	2.34	0.74	0.04	0.47	0.02
Remal Dam & Reservoir	178039	Keonjhar	1.55	0.36	0.02	0.31	0.02

ODISHA

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Rengali Reservoir	1503	Deogarh	310.04	155.82	8.18	62.01	3.26
Total						**244.05**	**12.81**

PUDUCHERRY

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Osudu Lake	179560	Puducherry	5.67	0.85	0.04	0.85	0.04
Total						**0.85**	**0.04**

PUNJAB

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Nangal Dam	175567	Rupnagar	3.07	2.00	0.10	0.61	0.03
Total						**0.61**	**0.03**

RAJASTHAN

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Anas River	1388092	Banswara	0.51	0.23	0.01	0.10	0.01
Angor Bandh	1385607	Sirohi	0.72	0.31	0.02	0.14	0.01
Baretha Dam	176815	Bharatpur	4.68	0.21	0.01	0.21	0.01
Bilasi dam	177104	Baran	1.29	0.18	0.01	0.18	0.01
Bisalpur Reservoir	15469	Tonk	59.28	40.40	2.12	11.86	0.62
Chambal River	177071	Kota	9.08	1.79	0.09	1.79	0.09
Dungarpur Reservoir	1387343	Dungarpur	0.37	0.18	0.01	0.07	0.00
Fields	177251	Jhalawar	5.38	0.88	0.05	0.88	0.05

RAJASTHAN							
Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Gambheeri Reservoir	177203	Chittaurgarh	1.36	0.12	0.01	0.12	0.01
Gudha Bandh	177016	Bundi	2.57	0.85	0.04	0.51	0.03
Kalisil Dam	176895	Karauli	8.45	0.51	0.03	0.51	0.03
Karauli	176848	Karauli	1.32	0.63	0.03	0.26	0.01
Khari Dam	176980	Bhilwara	1.77	0.37	0.02	0.35	0.02
Kothari River	177044	Bhilwara	1.20	0.13	0.01	0.13	0.01
Mahi Reservoir	15536	Banswara	42.67	22.62	1.19	8.53	0.45
Meja Baandh	1384698	Bhilwara	0.84	0.47	0.02	0.17	0.01
Moti Magri	177237	Udaipur	1.74	0.59	0.03	0.35	0.02
Rajsamand Lake	15491	Raj Samand	10.66	3.01	0.16	2.13	0.11
Rana Pratap Sagar	1481	Chittaurgarh	171.06	131.39	6.90	34.21	1.80
SKRAU Diggi	1381790	Bikaner	0.23	0.10	0.01	0.05	0.002
Som Kamla Reservoir	177354	Udaipur	6.91	2.97	0.16	1.38	0.07
Total						**63.94**	**3.36**

TAMIL NADU							
Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Aliyar Dam	179752	Coimbatore	4.58	2.24	0.12	0.92	0.05
Amaravathi Reservoir	179760	Tiruppur	5.73	1.21	0.06	1.15	0.06
Ambattur Lake	1399216	Tiruvallur	0.19	0.10	0.01	0.04	0.002
Ariyaman Beach	179891	Ramanathapuram	2.13	0.98	0.05	0.43	0.02
Avalanche Lake	179651	Nilgiris	3.11	1.62	0.08	0.62	0.03
Bhavanisagar Reservoir	15811	Erode	29.00	15.46	0.81	5.80	0.30
Chembarambakkam Lake	15781	Kanchipuram	12.59	5.33	0.28	2.52	0.13
Chittar Dam	180015	Kanyakumari	2.07	1.02	0.05	0.41	0.02
Cholavaram Tank	179315	Tiruvallur	1.76	0.99	0.05	0.35	0.02

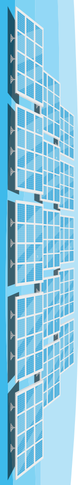
TAMIL NADU							
Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Fly Ash Pond	179609	Cuddalore	1.11	0.16	0.01	0.16	0.01
Fly Ash Pond	1401293	Cuddalore	0.36	0.13	0.01	0.07	0.004
Gomuki Dam	179581	Kallakkurichi	1.76	0.12	0.01	0.12	0.01
Kadaladi Reservoir	179908	Ramanathapuram	9.91	6.06	0.32	1.98	0.10
Kamarajar Sagar Dam	179776	Dindigul	1.06	0.38	0.02	0.21	0.01
Karayar Dam	179974	Tirunelveli	4.63	2.78	0.15	0.93	0.05
Kodayar Dam Upper	180000	Kanyakumari	4.56	2.69	0.14	0.91	0.05
Korattur Lake	1399223	Chennai	0.77	0.34	0.02	0.15	0.01
Kovilpadagai Tank	1399161	Tiruvallur	0.53	0.13	0.01	0.11	0.01
Kullursandai Reservoir	179836	Virudhunagar	1.33	0.28	0.01	0.27	0.01
Manimangalam Lake	179392	Kanchipuram	1.31	0.20	0.01	0.20	0.01
Manimutharu Dam	179975	Tirunelveli	7.71	3.57	0.19	1.54	0.08
Metturdam	1542	Salem	120.70	62.13	3.26	24.14	1.27
Mugavai Oorani	179871	Ramanathapuram	5.91	1.00	0.05	1.00	0.05
Mukkadal Dam	1404043	Kanyakumari	0.39	0.17	0.01	0.08	0.004
Muniyappan Lake	179777	Nagapattinam	7.44	2.19	0.11	1.49	0.08
Nagar Malai	179504	Krishnagiri	2.22	1.14	0.06	0.44	0.02
Nagavathi Dam Reservoir	1400802	Dharmapuri	0.54	0.10	0.01	0.10	0.01
Nathapettai Lake	1399662	Kanchipuram	0.75	0.11	0.01	0.11	0.01
Pechiparai Reservoir	180010	Kanyakumari	9.29	6.08	0.32	1.86	0.10
Perumal Lake	179599	Cuddalore	5.73	1.24	0.07	1.15	0.06
Perumal malai	179751	Tiruppur	3.71	2.24	0.12	0.74	0.04
Puzhal Lake	15779	Tiruvallur	13.24	9.57	0.50	2.65	0.14
Rajaankulam	179436	Kanchipuram	1.47	0.25	0.01	0.25	0.01
Sandynulla	1401461	Nilgiris	0.92	0.32	0.02	0.18	0.01
Sathanur Reservoir	15800	Tiruvannamalai	19.46	4.68	0.25	3.89	0.20
Servalar Dam	1403534	Tirunelveli	0.80	0.36	0.02	0.16	0.01
Thalapalli Hill	179471	Krishnagiri	8.88	3.57	0.19	1.78	0.09
The Great Salt Lake	1399799	Chengalpattu	0.89	0.36	0.02	0.18	0.01
Theneri Lake	179400	Kanchipuram	6.69	1.88	0.10	1.34	0.07

TAMIL NADU							
Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Thiruvellaivayal Lake	179253	Tiruvallur	1.12	0.69	0.04	0.22	0.01
Thiruvellaivayal Lake	1398909	Tiruvallur	0.97	0.30	0.02	0.19	0.01
Tuticorin Bay	179951	Tuticorin	1.21	0.15	0.01	0.15	0.01
Uppar Water Reservoir	179726	Tiruppur	2.86	0.25	0.01	0.25	0.01
Upper Aliyar Reservoir	1402093	Coimbatore	0.88	0.15	0.01	0.15	0.01
Upper Aliyar Reservoir	1402135	Coimbatore	0.80	0.32	0.02	0.16	0.01
V Salai Lake	1400793	Villupuram	0.55	0.12	0.01	0.11	0.01
Vaigai Dam Resevoir	179796	Teni	7.32	4.67	0.25	1.46	0.08
Valinokkam salt lake	1403120	Ramanathapuram	0.48	0.17	0.01	0.10	0.01
Vaniyaru Water Reservoir	1400979	Dharmapuri	0.97	0.19	0.01	0.19	0.01
Veeranam Lake	179654	Cuddalore	2.84	0.12	0.01	0.12	0.01
Venbakkam	1399683	Kanchipuram	0.81	0.13	0.01	0.13	0.01
Total						**63.68**	**3.34**

TELANGANA							
Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Aleru Cheruvu	1394568	Mahabubabad	0.33	0.10	0.01	0.07	0.003
Ashwaraopalli Cheruvu	1394375	Jangaon	0.59	0.26	0.01	0.12	0.01
Balancing Reservior	178395	Peddapalli	9.57	4.07	0.21	1.91	0.10
Balancing Reservoir	1394495	Warangal (Rural)	0.64	0.36	0.02	0.13	0.01
Balancing Reservoir	1395960	Jogulamba Gadwal	0.94	0.34	0.02	0.19	0.01
Bellal talab	178416	Nizamabad	1.62	0.46	0.02	0.32	0.02
Bhimghanpur Lake	178442	Jayashankar Bhupalapally	3.01	1.49	0.08	0.60	0.03
Bodabanda	178679	Suryapet	1.50	0.42	0.02	0.30	0.02
Burugu Kunta	178399	Peddapalli	1.08	0.39	0.02	0.22	0.01
Chali vagu project	178493	Warangal (Rural)	2.64	0.49	0.03	0.49	0.03
Cheruvumadharam Lake	178671	Khammam	1.59	0.27	0.01	0.27	0.01

TELANGANA							
Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
D83 Main Canal	1393557	Peddapalli	0.96	0.33	0.02	0.19	0.01
Darmaram Cheruvu	1393333	Nizamabad	0.51	0.11	0.01	0.10	0.01
Darshala Gutta	1393836	Ranjanna Sircilla	0.82	0.18	0.01	0.16	0.01
Doulthabad Cheruvu	1395205	Vikarabad	0.83	0.12	0.01	0.12	0.01
Garla Cheruvu	1394645	Mahabubabad	0.39	0.23	0.01	0.08	0.004
Ghanpur Lake	178463	Jayashankar Bhupalapally	6.89	2.15	0.11	1.38	0.07
Godavari River_Mutharam Chowk, Telangana	1393878	Mulugu	0.19	0.10	0.01	0.04	0.002
Gorre Gutta	1393035	Nirmal	0.77	0.18	0.01	0.15	0.01
Gundaram Cheruvu	1393454	Nizamabad	0.48	0.27	0.01	0.10	0.01
Himayat Sagar Lake	178628	Rangareddy	8.29	5.11	0.27	1.66	0.09
Indalvai Cheruvu	1393652	Nizamabad	0.80	0.19	0.01	0.16	0.01
Inuparathi Guttalu	1394190	Warangal (Urban)	0.93	0.67	0.04	0.19	0.01
Jangalnala	1393339	Jagtial	0.69	0.19	0.01	0.14	0.01
Juntupally Reservior	1395031	Vikarabad	0.71	0.29	0.02	0.14	0.01
Jurala Dam	15714	Jogulamba Gadwal	27.46	16.51	0.87	5.49	0.29
Kalyani Project Dam	178475	Kamareddy	1.48	0.50	0.03	0.30	0.02
Kanayapalle Balancing Reservoir	1395803	Wanaparthy	0.54	0.23	0.01	0.11	0.01
Kinnerasani Project	15689	Bhadradri Kothagudem	17.15	7.12	0.37	3.43	0.18
Kistapur Chervu	1393737	Kamareddy	0.45	0.11	0.01	0.09	0.005
Lake	178503	Warangal (Urban)	2.93	0.29	0.02	0.29	0.02
Lanka Sagar	178651	Khammam	3.82	1.51	0.08	0.76	0.04
Lower Manair Dam	15672	Siddipet	49.29	29.24	1.54	9.86	0.52
Manjeera Reservoir	178572	Sangareddy	4.64	0.70	0.04	0.70	0.04
Mirsipally Pond	1395903	Wanaparthy	0.51	0.12	0.01	0.10	0.01
Molangur Khila	1393873	Karimnagar	0.40	0.11	0.01	0.08	0.004
Muneshwarla Gutta	1394818	Yadadri Bhuvanagiri	0.57	0.19	0.01	0.11	0.01
Muneshwarla Gutta	1394850	Yadadri Bhuvanagiri	0.67	0.12	0.01	0.12	0.01
Nagarjuna Hill	1519	Nalgonda	195.24	62.06	3.26	39.05	2.05

TELANGANA							
Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Nagarkurnool Lake	1395733	Nagarkurnool	0.87	0.32	0.02	0.17	0.01
Naubat Pahad	178610	Hyderabad	3.94	1.90	0.10	0.79	0.04
Neella Kunta	178636	Nalgonda	1.42	0.72	0.04	0.28	0.01
Nirmal lake	1393000	Nirmal	0.44	0.12	0.01	0.09	0.005
Nizamabad-Mallaram forest	1393504	Nizamabad	0.52	0.26	0.01	0.10	0.01
Nizamsagar Lake	1511	Kamareddy	108.33	21.07	1.11	21.07	1.11
Osman Sagar	15693	Rangareddy	13.00	8.29	0.44	2.60	0.14
Padmakshi Hill	178516	Warangal (Urban)	1.08	0.46	0.02	0.22	0.01
Paler Reservior	15701	Khammam	12.15	3.91	0.21	2.43	0.13
Panagal Reservoir	178664	Nalgonda	1.17	0.57	0.03	0.23	0.01
Pedda Devulapalli Reservoir	178689	Nalgonda	2.73	0.54	0.03	0.54	0.03
R. Vidyasagar Rao Dindi Lift Irrigation Scheme	15708	Nagarkurnool	14.53	5.10	0.27	2.91	0.15
Ramadugu Project	178417	Nizamabad	1.93	0.42	0.02	0.39	0.02
Raman Pahad Reservoir	178759	Wanaparthy	2.57	0.75	0.04	0.51	0.03
Ramappa Lake	15676	Mulugu	11.95	6.49	0.34	2.39	0.13
Regulagundi Lake	1394283	Bhadradri Kothagudem	0.45	0.14	0.01	0.09	0.005
Sangampet Lake	178356	Nirmal	1.28	0.41	0.02	0.26	0.01
Shali Gowraram Project	178630	Nalgonda	1.47	0.70	0.04	0.29	0.02
Shamirpet Lake	1394562	Medchal-Malkajgiri	0.87	0.13	0.01	0.13	0.01
Singavaram Cheruvu	178668	Suryapet	1.05	0.19	0.01	0.19	0.01
Singur Dam Reservoir	1515	Sangareddy	104.17	62.62	3.29	20.83	1.09
Sriram Sagar Reservoir	1509	Nizamabad	334.76	35.26	1.85	35.26	1.85
Srisailam Dam Reservoir	1524	Nagarkurnool	534.57	39.77	2.09	39.77	2.09
Sthambampally Pedda Cheruvu Fishing pond	1393285	Jagtial	0.91	0.13	0.01	0.13	0.01
Tekulapalle seasonal lake	1394590	Bhadradri Kothagudem	0.54	0.19	0.01	0.11	0.01
Wyra Reservoir	15700	Khammam	11.16	5.13	0.27	2.23	0.12
Yathavakilla Lake	178698	Suryapet	2.39	0.16	0.01	0.16	0.01
Yelgur Lake	178526	Warangal (Rural)	1.16	0.57	0.03	0.23	0.01
Total						**204.15**	**10.72**



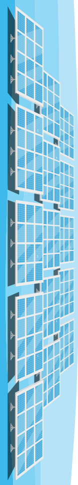
UTTAR PRADESH

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Benti Lake	176996	Pratapgarh	1.72	0.15	0.01	0.15	0.01
Betwa River Dam	15480	Jhansi	14.77	6.70	0.35	2.95	0.16
Bhaira	177064	Jhansi	3.63	1.00	0.05	0.73	0.04
Bokta Taal	1383029	Gorakhpur	0.73	0.12	0.01	0.12	0.01
Dhandharoul Dam	15508	Sonbhadra	11.04	3.28	0.17	2.21	0.12
Garhmau Lake	177012	Jhansi	1.49	0.14	0.01	0.14	0.01
Gobind Sagar	177216	Lalitpur	8.67	4.07	0.21	1.73	0.09
Govind Ballabh Pant Sagar	1487	Sonbhadra	397.91	135.13	7.09	79.58	4.18
Jargo Dam	15492	Mirzapur	22.92	8.11	0.43	4.58	0.24
Rajghat Reservoir	15502	Lalitpur	46.62	28.42	1.49	9.32	0.49
Rihand River	15511	Sonbhadra	14.18	8.35	0.44	2.84	0.15
Sarua Lake	176801	Gorakhpur	2.41	0.21	0.01	0.21	0.01
Sukma Dukma Reservoir	15486	Lalitpur	14.97	2.55	0.13	2.55	0.13
Surahataal	15471	Ballia	11.82	0.28	0.01	0.28	0.01
Total						**107.40**	**5.64**

UTTARAKHAND

Water Body Name	Hylake id	Majority District	Actual Area (km^2)	Feasible Area (km^2)	Potential (GW)	Feasible Area (km^2) with 20% restriction	Potential (GW) with 20% restriction
Bairaj Lake	1378722	Dehradun	0.83	0.61	0.03	0.17	0.01
Bairaj Lake	1378749	Dehradun	0.23	0.11	0.01	0.05	0.002
Dhora Dam	176482	Udham Singh Nagar	8.16	0.13	0.01	0.13	0.01
Kumali Kot	1380068	Nainital	0.26	0.12	0.01	0.05	0.003
Ramganga Reservoir	15361	Pauri Garhwal	47.10	24.47	1.28	9.42	0.49
Tehri Dam Reservoir	15304	Tehri Garhwal	18.88	7.32	0.38	3.78	0.20
Tumria Barrage	15371	Udham Singh Nagar	14.53	1.08	0.06	1.08	0.06
Total						**14.67**	**0.77**

WEST BENGAL							
Water Body Name	Hylake id	Majority District	Actual Area (km²)	Feasible Area (km²)	Potential (GW)	Feasible Area (km²) with 20% restriction	Potential (GW) with 20% restriction
Chandibari Pukur	177646	North Twenty-Four Parganas	1.38	0.34	0.02	0.28	0.01
Jheel	177739	North Twenty-Four Parganas	2.73	0.70	0.04	0.55	0.03
Jheel	177742	North Twenty-Four Parganas	1.80	0.25	0.01	0.25	0.01
Koro Hill	1387997	Bankura	0.94	0.17	0.01	0.17	0.01
Muradi Hill	177434	Puruliya	1.29	0.55	0.03	0.26	0.01
Panchet Hill Reservoir	15534	Puruliya	47.77	19.61	1.03	9.55	0.50
Pond	1389426	North Twenty-Four Parganas	0.97	0.33	0.02	0.19	0.01
Pond	1390145	Purba Medinipur	0.80	0.45	0.02	0.16	0.01
Rameswara Waterview	1389309	North Twenty-Four Parganas	0.75	0.12	0.01	0.12	0.01
Saheb Bandh Lake	1387871	Puruliya	0.57	0.11	0.01	0.11	0.01
Sardar Pukur	177664	North Twenty-Four Parganas	1.09	0.49	0.03	0.22	0.01
Sardar Pukur	177665	North Twenty-Four Parganas	2.13	0.91	0.05	0.43	0.02
Sardar Pukur	177676	North Twenty-Four Parganas	3.24	1.25	0.07	0.65	0.03
Sardar Pukur	177677	North Twenty-Four Parganas	8.09	3.32	0.17	1.62	0.08
Tara Pukur	177661	North Twenty-Four Parganas	1.92	0.14	0.01	0.14	0.01
Total						**14.69**	**0.77**



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