Harnessing Small Hydro Power

Mains: *PIB Analysis*

Introduction

- Hydropower, generated from the natural flow of water, is among the world's most reliable and established renewable energy sources.
- Amid India's evolving energy landscape, it plays a pivotal role in ensuring grid stability, energy security, and power system resilience.
- Hydropower provides firm, round-the-clock electricity alongside operational flexibility. As India accelerates its transition towards a cleaner energy mix, hydropower remains an important pillar of sustainable electricity generation.
- Small Hydropower (SHP), comprising projects with installed capacity up to 25 MW, offers significant opportunities for harnessing India's untapped water resources.
- With substantial potential across Himalayan states, the North Eastern region, and other parts of the country, small hydro projects can contribute meaningfully to India's renewable energy capacity.
- Recognising this potential, the Government of India has introduced various initiatives to promote small hydropower development, encourage investment, and harness untapped resources.
- These efforts aim to expand clean energy generation while improving electricity access in remote and geographically challenging regions.
- Beyond electricity generation, small hydropower offers several developmental and economic benefits.
- Compared with large hydroelectric projects, these installations generally require smaller land areas and can have relatively limited environmental footprints.
- They can promote local investment, generate employment, strengthen regional infrastructure, and support economic activities in remote areas.
- By complementing other renewable energy sources and diversifying the country's energy portfolio, small hydropower can contribute to India's energy security and sustainable development objectives.

Did You Know?
• In India, the primary distinction between large and small hydropower projects lies in their installed capacity and the respective ministerial jurisdiction.
• Small Hydropower Projects (SHP) are defined as those with an installed capacity of up to 25 MW and are administered by the Ministry of New and Renewable Energy (MNRE).
• In contrast, large hydropower projects, with capacity exceeding 25 MW, fall under the purview of the Ministry of Power.

Government Initiatives for Small Hydropower Development

- The Ministry of New and Renewable Energy (MNRE) is the nodal ministry responsible for promoting small hydro projects.
- The Government of India has recently approved the Small Hydro Power (SHP) Development Scheme for FY 2026–27 to FY 2030–31, with an outlay of Rs. 2,584.60 crore.
- The scheme aims to add approximately 1,500 MW of small hydro capacity.
- It prioritises hilly, North-Eastern and border regions through financial assistance, project preparation support and technical capacity building.
- The scheme outlines a set of targeted measures to support implementation, improve project viability, and ensure a steady pipeline of SHP projects across regions.
- It focuses on addressing key constraints related to financing, project readiness, and execution, particularly in challenging geographies.
- Together, these measures are intended to enable faster and more efficient deployment of SHP capacity.

Financial Support Structure:

- Financial assistance to North Eastern States & International Border Districts of Rs 3.6 crore per MW or 30% of project cost (whichever is lower), subject to a ceiling of Rs 30 crore per project.
- Financial assistance to other locations of @ Rs 2.4/1.78/2.054 crore per MW (depending on the size and location of the project) or 20% of project cost (whichever is lower), with a cap of Rs 20 crore per project.

Investment and Economic Impact:

- The scheme is expected to attract investments of around Rs 15,000 crore in the small hydro sector.
- It will also promote the use of indigenous plant and machinery, contributing to the vision of Atmanirbhar Bharat while boosting local manufacturing and supply chains.

Pipeline Development and DPR Support:

- To ensure long-term sector growth, the scheme provides support for the preparation of Detailed Project Reports (DPRs) for a minimum of 200 projects.
- An allocation of Rs 30 crore has been made separately to assist central and state agencies in developing a strong future project pipeline.

Employment Generation:

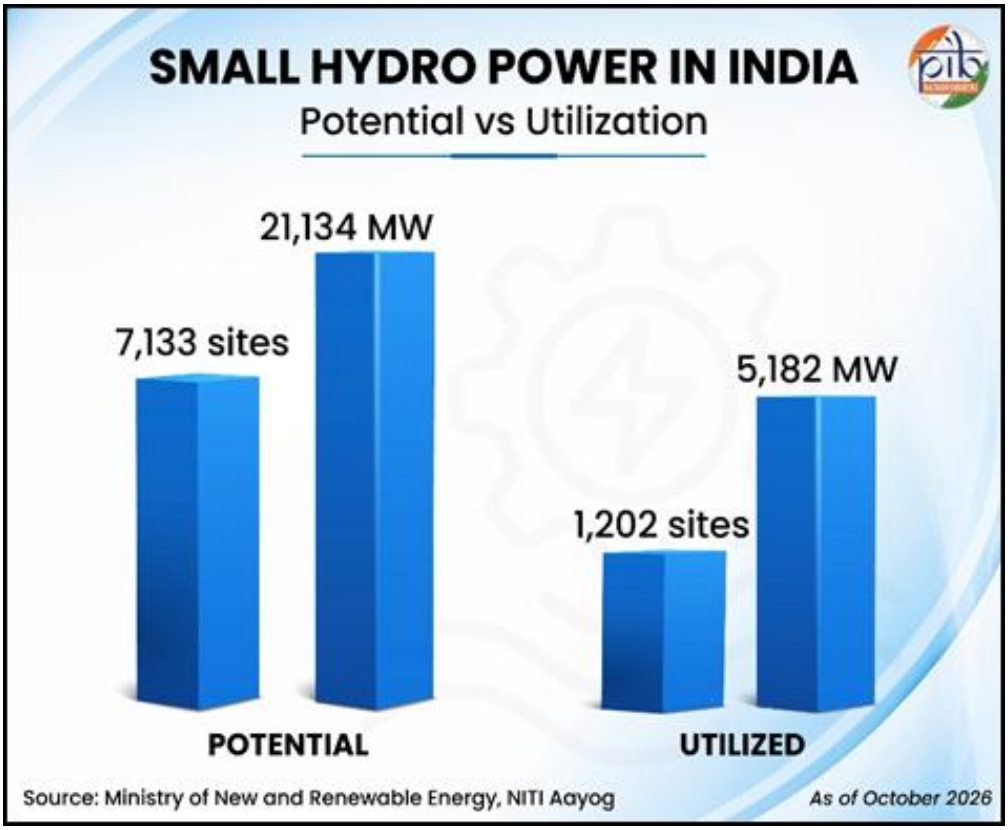
- The scheme is expected to generate approximately 51 lakh person-days of employment during the construction phase.
- In addition, it will create sustained employment opportunities in the operation and maintenance of projects, particularly in rural and remote regions.
- The approval of the SHP Development Scheme marks a significant step towards unlocking India’s untapped small hydro potential.
- By combining targeted financial support, infrastructure development, and

sustainability, the scheme is set to strengthen clean energy capacity while driving inclusive growth in underserved regions.

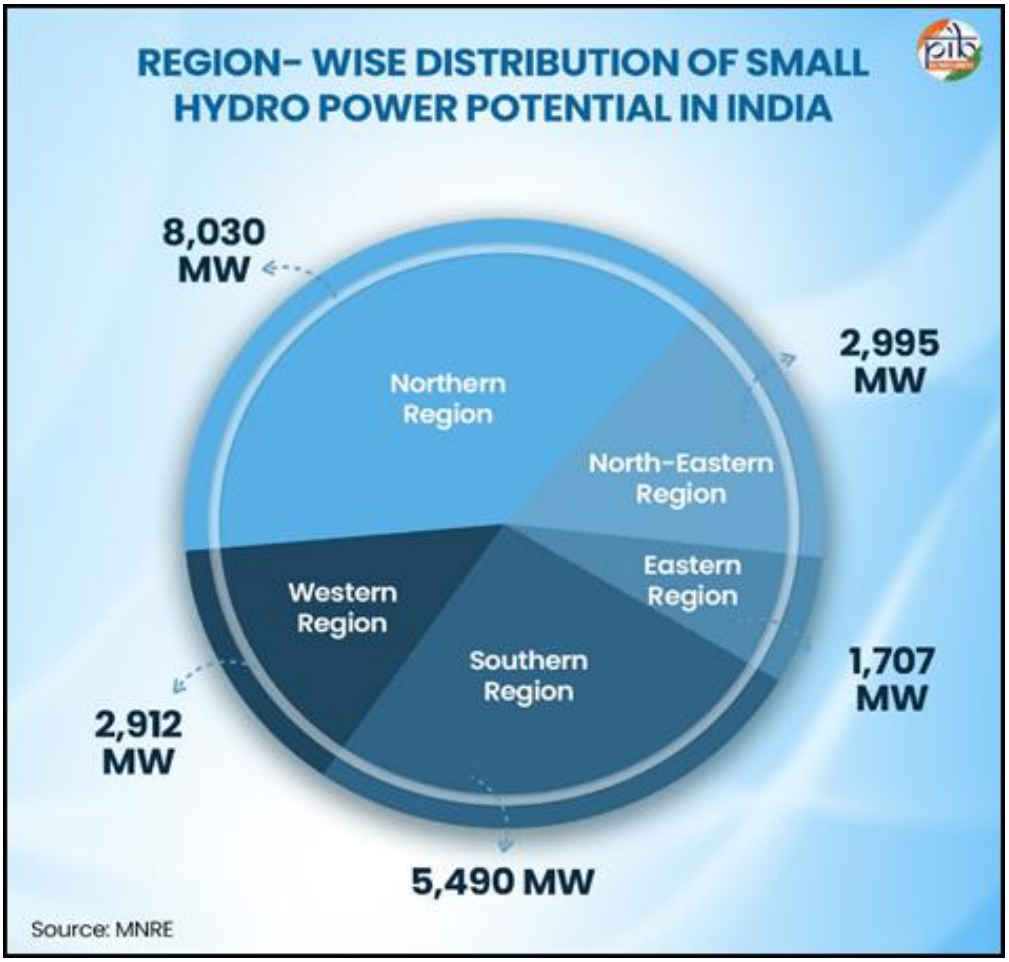
Significance of Small Hydro Power for Sustainable Energy Development

- Small hydro power plays a vital role in advancing clean, reliable, and decentralised energy in India.
- Particularly suited for remote and hilly regions, these projects utilise locally available water resources to generate electricity close to consumption centres.
- This not only improves energy access but also reduces dependence on long transmission networks and enhances overall efficiency.
- **Decentralised and Efficient Power Supply**: Located near demand centres, these projects minimise transmission losses, improve voltage stability, and ensure reliable power in geographically challenging areas, including border and hilly regions.
- **Clean and Cost-Effective Energy Source**: Small hydro power generates electricity without fuel consumption or emissions, making it a sustainable and economically viable long-term solution.
- **Driver of Rural Development**: By improving electricity access in underserved areas, these projects support infrastructure development and act as a catalyst for local economic growth.
- **Employment and Livelihood Generation**: They create both direct and indirect employment opportunities during construction and operation, while also promoting small-scale industries and self-employment.
- **Environmentally Sustainable**: With minimal land requirement and negligible displacement, small hydro power projects have a low ecological footprint and limited social impact. Their long operational life further strengthens their sustainability.
- SHP offers a balanced solution that combines energy security with sustainable development.
- By delivering reliable, round-the-clock power and strengthening grid resilience, especially in remote areas, they contribute significantly to inclusive growth.
- Their ability to integrate environmental sustainability with socio-economic benefits makes them a key component of India’s clean energy transition.

Small Hydro Power Potential and Prospects in India



- SHP is emerging as a vital and reliable component of India’s clean energy transition.
- It is particularly well-suited for hilly, remote, and difficult terrains where decentralised generation can deliver sustainable power, enhance energy access, and support local livelihoods.
- India possesses a significant SHP potential of 21,134 MW across 7,133 identified sites.
- As of 30 September 2026, approximately 5,182 MW (around 25%) has already been harnessed, demonstrating steady progress.
- The remaining 15,952 MW represents a substantial opportunity for accelerated development through focused policy support and public-private collaboration.



- The regional distribution of this potential further reflects India's rich geographical diversity and offers unique strengths across the country.
- The Northern region has 8,030 MW of SHP potential, particularly across mountainous terrains.
- The North-Eastern region holds 2,995 MW, positioning it as a key frontier for expansion, especially in hilly regions and the North Eastern States.
- The list is followed by the Southern region with 5,490 MW of SHP, supported by well-developed river systems and infrastructure.
- The Western region has a potential of 2,912 MW of SHP, while the Eastern region accounts for 1,707 MW with strong potential in rural and tribal areas.
- This distributed potential allows for a balanced, region-specific strategy.
- While the Northern and North-Eastern regions offer large untapped resources, the Southern and Western regions are better positioned for quicker implementation due to stronger infrastructure.
- With the recently approved Small Hydro Power Development Scheme, the Government of India is committed to harnessing this diverse potential through targeted incentives, simplified procedures, and enhanced financial support.
- By adopting a focused yet inclusive approach, India is poised to unlock the full benefits of small hydropower, strengthening energy security, promoting inclusive growth, and advancing the nation's goal of a sustainable and self-reliant energy future.

Northern region

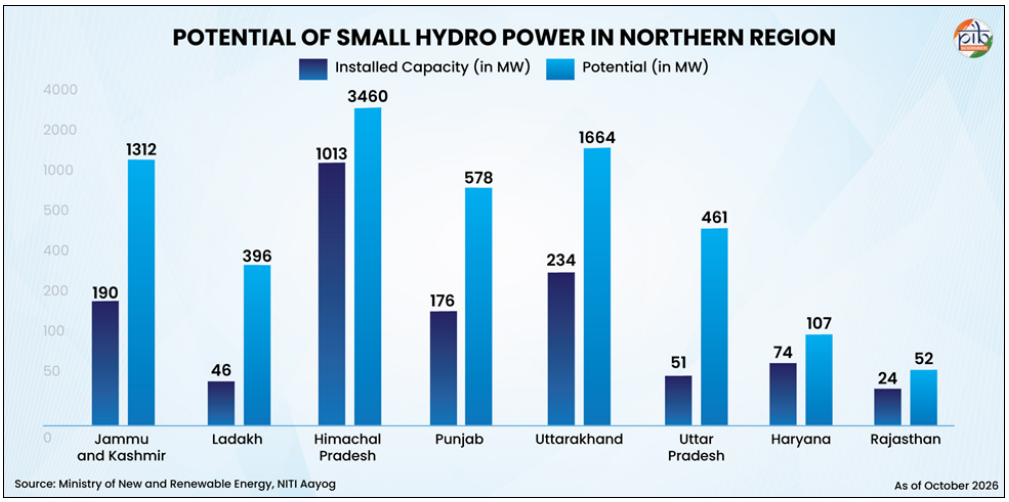
- The Northern region forms the backbone of India's SHP landscape, driven by its

mountainous terrain, perennial rivers, and favourable hydrology, making it particularly significant for development in hilly regions.

- States such as Himachal Pradesh (3,460 MW), Uttarakhand (1,664 MW), and Jammu & Kashmir (1,312 MW) dominate the region's potential, with Ladakh (396 MW) adding strategic importance.
- Despite this strong resource base, utilisation levels remain moderate, indicating substantial untapped capacity.

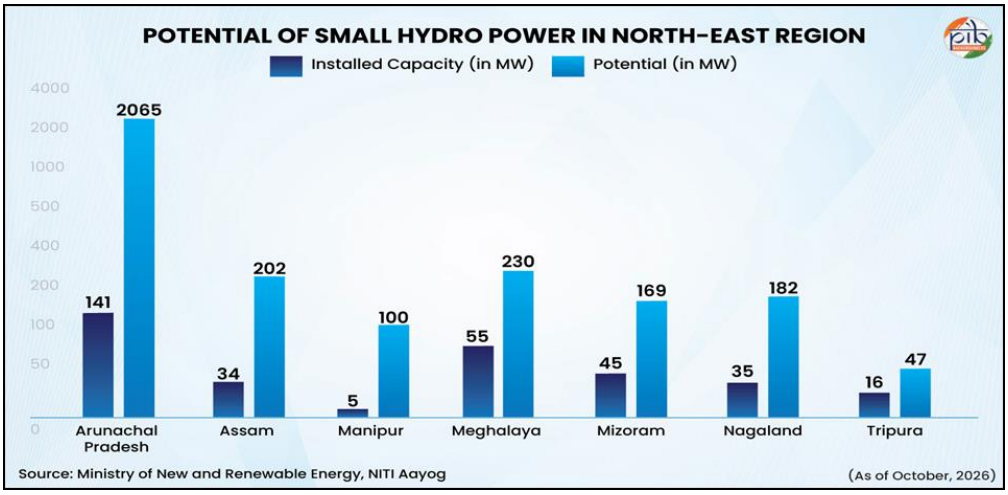
Run-of-the-river projects

• Run-of-the-river projects generate electricity by using the natural flow of river water without building large dams.
• A portion of water is diverted through channels and pipes to run turbines and is then released back into the stream, ensuring minimal ecological disruption.



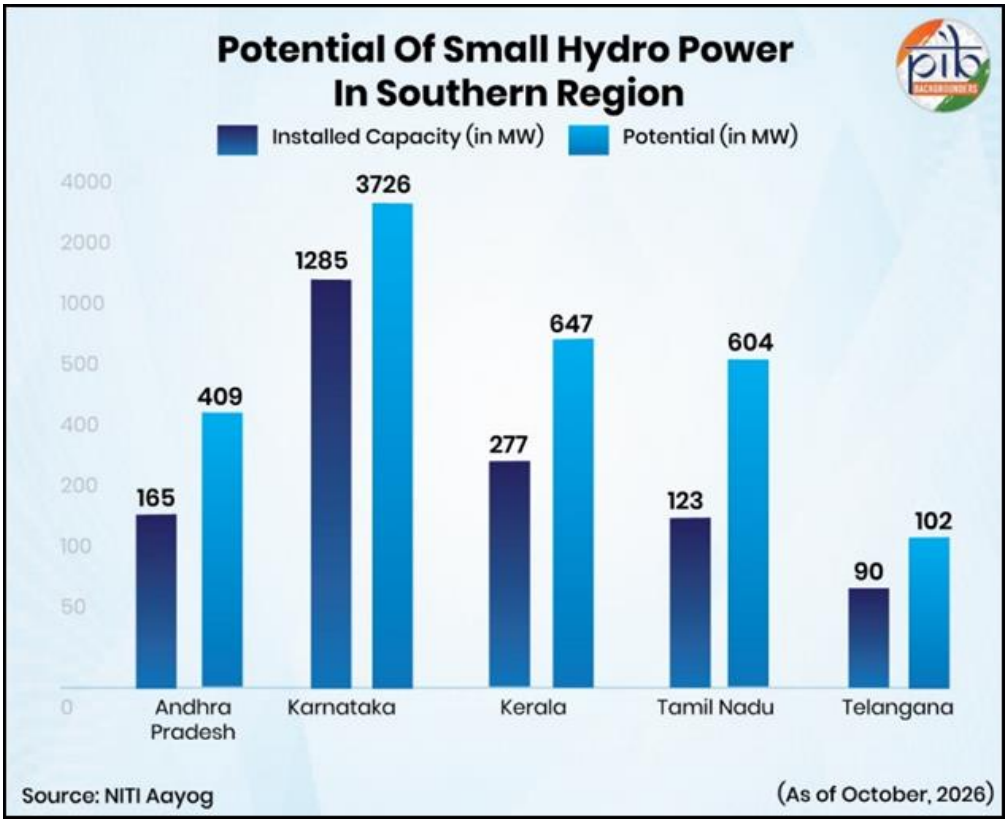
North-East region

- The North-Eastern region represents a high-potential growth frontier, particularly critical for expanding renewable energy in hilly regions and the North Eastern States.
- Arunachal Pradesh (2,065 MW) constitutes the largest share of the regional potential, followed by Meghalaya (230 MW), Assam (202 MW), Nagaland (182 MW), Mizoram (169 MW), Manipur (100 MW), and Tripura (47 MW).
- SHP development in this region offers strong opportunities for decentralised and off-grid energy solutions, particularly in remote and tribal areas.
- It can significantly enhance energy access, promote local employment, and reduce reliance on conventional fuels.
- With targeted policy interventions, improved connectivity, and community-driven models, the North-Eastern region can emerge as a major engine of growth for India's SHP sector



Southern region

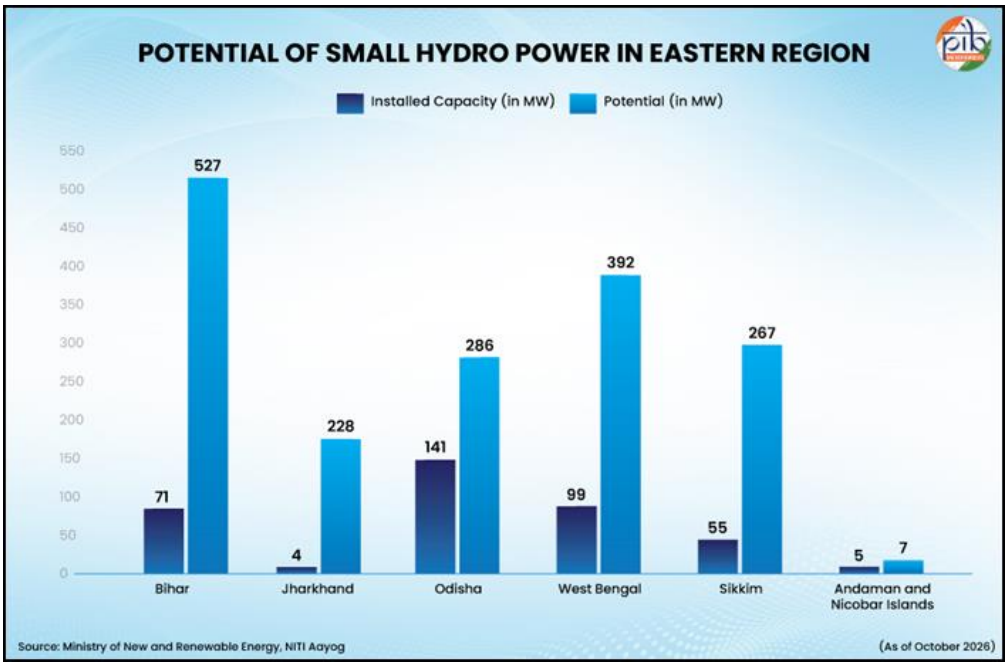
- The Southern region is a key contributor to SHP development, supported by strong infrastructure, established energy systems, and favourable river basins.
- Karnataka leads with 3,726 MW, accounting for nearly 68% of the regional potential, followed by Keralam 647 MW and Tamil Nadu 604 MW.
- The region has achieved relatively higher utilisation levels compared to others, reflecting efficient project execution and strong grid connectivity.



- With its robust infrastructure base, the Southern region is well-positioned to scale further through optimisation of existing assets and integration with other clean energy sources.
- It will continue to play a stabilising role in India’s SHP expansion, complementing growth in hilly regions and the North Eastern States.

Eastern region

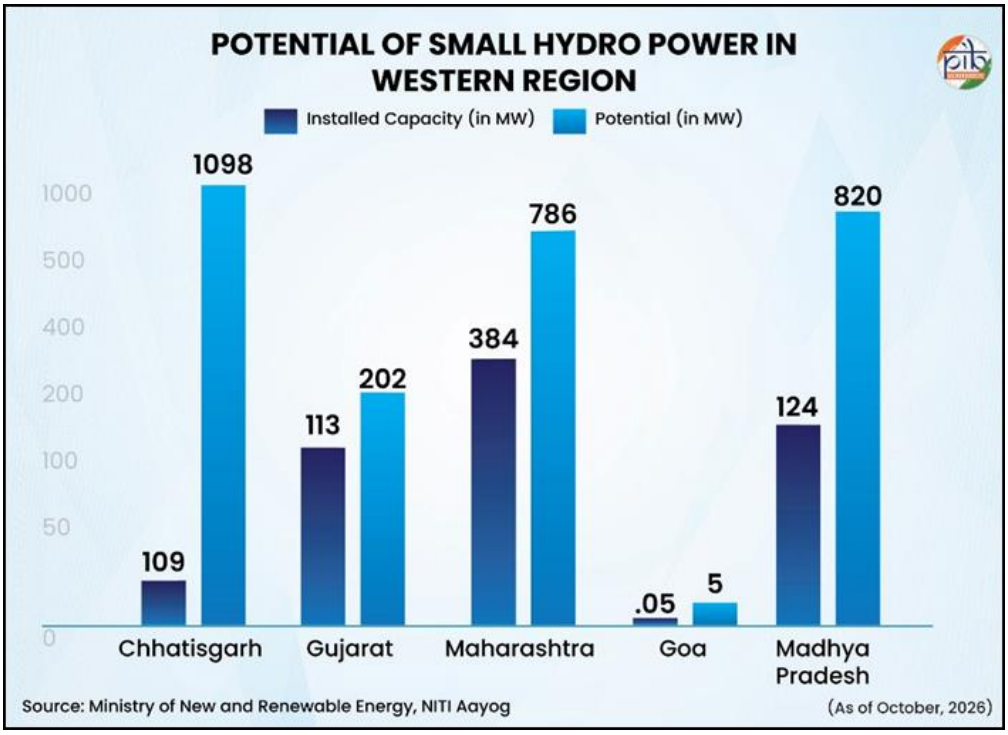
- The Eastern region offers moderate but strategically important SHP potential, particularly for decentralised development in rural and tribal areas.



- Bihar (527 MW), West Bengal (392 MW) and Odisha (286 MW) lead the region, followed by Sikkim (267 MW) and Jharkhand (228 MW).
- The region's river systems and terrain provide favourable conditions for small-scale hydro projects.
- Expanding SHP in this region can improve local energy access, agricultural productivity, and rural livelihoods, while supporting inclusive development.
- With targeted interventions, improved financing mechanisms, and decentralised deployment models, the Eastern region can complement national growth.

Western region

- The Western region presents unique opportunities for SHP development, particularly through its extensive irrigation and canal-based infrastructure.



- Chhattisgarh leads the region with 1,098.20 MW of potential, followed by Madhya Pradesh (820 MW) and Maharashtra (786 MW).
- Against a regional potential of 2,912 MW, installed capacity stands at 730 MW.
- Maharashtra and Gujarat record relatively higher utilisation, while others continue to offer scope for expansion.
- The region's focus on canal-based and dam-toe projects provides a cost-effective pathway for scaling SHP capacity.
- By leveraging existing infrastructure and promoting innovative deployment models, the Western region can strengthen decentralised renewable energy generation.
- Alongside advancements in hilly regions and the North Eastern States, it can play a critical role in ensuring a balanced and diversified SHP growth trajectory.

Did You Know?
• SHP projects on canal falls or dam toes utilise the drop in water levels in irrigation canals or just below dams and barrages to generate electricity.
• Water is diverted to the powerhouse and returned to the main canal after power generation, making use of existing water infrastructure.

Conclusion

- The Small Hydro Power Development Scheme (2026-31) marks a decisive policy intervention by the Government of India to harness the unique strengths of small hydropower in the country's clean energy journey.
- With an outlay of Rs 2,584.60 crore aimed at adding 1,500 MW of new capacity, the scheme prioritises reliable, decentralised power generation, especially in challenging terrains where other renewable sources face limitations.
- Beyond capacity creation, the initiative is designed to deliver broader developmental outcomes.
- By combining targeted financial support, streamlined project preparation, and promotion of indigenous manufacturing, it will stimulate private investment,

strengthen domestic supply chains, and generate meaningful employment opportunities in remote and rural regions.

- This integrated approach positions small hydropower as an effective tool for inclusive growth and regional equity.
- As India advances towards greater energy self-reliance and a sustainable future, small hydropower offers a balanced solution that combines environmental responsibility with socio-economic progress.
- With this focused push, the Government of India is confident that the scheme will illuminate underserved areas, enhance grid resilience, and contribute meaningfully to building a cleaner, stronger, and more self-sufficient India.

Reference

PIB | Harnessing Small Hydro Power

