

SOLAR ENERGY INTEGRATION IN URBAN ENVIRONMENTS: CHALLENGES AND OPPORTUNITIES FOR SUSTAINABLE DEVELOPMENT

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ABSTRACT

Urban solar energy integration offers the different opportunities and issues that are noteworthy for sustainable development. Urban locales have space requirements, unpredictable framework, and fluctuating energy needs, all of which make it challenging for solar advancements to be embraced reliably. Be that as it may, progressions in energy limit plans, photovoltaic systems, and smart organization advances present practical ways over these obstructions. By using solar power in urban settings, less waste from petroleum products is delivered, energy variety is expanded, local area monetary development is cultivated through the creation and advancement of occupations, and oppressed organizations' admittance to energy is additionally evolved. To completely coordinate solar energy into urban environments and make ready for a stronger and sustainable future, it is basic to have powerful essential structures, inventive subsidizing systems, and neighbourhood. A developing interest in coordinating solar power systems into urban settings has been energized by the expanded spotlight on sustainable energy plans all over the planet. Solar energy gadgets that are sans contamination and environment cordial help the sustainable development of lively metropolitan areas. The solar foundation is subject to how open the region is to sun radiation in the predetermined region. The current study presented the various opportunities and challenges in integrating solar energy in urban environments. The study also analyzes evolving technologies and approaches that raise the efficiency of solar energy systems in urban contexts. Additionally, the study offers insightful information for investigators, decision makers and practitioners striving at advancing sustainable energy alternatives in urban areas.

Keywords: *Solar Energy Integration, Urban Environments, Sustainable Development*

1. INTRODUCTION

The use of solar energy as a source of energy that may be chosen is a hallmark of technological innovation to satisfy the evolving needs of modern applications. Since solar energy is a relatively unexplored logical topic, specific research groups have been established to guide theoretical and practical experiments and make use of the various resources at hand in order to achieve the ideal goal of sustainable power sources for their various uses. Urban furniture that incorporates solar energy is a creative and sustainable approach to urban planning. It can reduce the carbon footprint and environmental impact of urban furniture while providing smart, practical, and fashionable

benefits. This has aided in the creation of reasonable and environmentally safe breakthroughs in this field, and any nation would benefit greatly from the development of these sources.

Development that is sustainable is that which solves current problems without undermining people's ability to solve their own problems in the future. Concerns about climate change, dangerous atmospheric depletion, and the need to provide sustainable energy sources in the future are driving the growing importance of sustainable energies. Sustainable energy, also known as elective wellsprings of energy, is any form of energy that is clean, dependable, and releases very little in the way of contaminating gases. Examples of such energy sources include geothermal, biomass, solar, wind, and so on. Solar energy is one of the best technological developments since it is a reliable, sustainable power source that helps reduce the release of substances that damage the ozone layer and control aberrant weather patterns. The field of energy has a remarkable role in enhancing human fulfillment. A large assembly of rural families, who are reliant on scarce and subpar energy sources, serves as an example of India's energy use. India approaches development and progress through a manageable approach to development. One of the things that is thought to improve India's manageability is solar energy. India's location in the tropical belt makes solar energy quite feasible.

The great majority of power distribution companies in India are unable to fulfill their sustainable purchase obligations due to excessive transmission and circulation losses. Therefore, one option available to those governments is to transfer unrestricted purchase obligations to large power users who already pay high power taxes and are almost at matrix equality. Increasing these power customers' interest in solar is another important factor driving the Indian solar business. The removal of obstacles is moving forward and is providing strong support for the growth of the solar market. This study examines the role of solar power in India's sustainable development, considering the current state of solar power, barriers and solutions to industrial boundaries, and the potential future role of solar power in India's sustainable development.

Many solar energy innovations are not yet competitively priced when compared to conventional energy sources. It is impossible to envision considerable advancements in solar energy until important approach motivators are introduced. Several nations have acknowledged the problem and supported the expansion of solar energy through a wide range of tools, including advancement, tyranny, money, and other resources. Various approaches aim to promote sustainable electricity, such as solar power, both globally and in relation to a particular nation, such as India. The development of solar energy is being aided by the sustainable implementation of agreements in developed and developing countries, primarily for framework-associated solar photovoltaic and solar warm water warming frameworks.

2. LITERATURE REVIEW

A.R.Javed et al. (2022) examined the latest advancements and parameters needed for building smart cities, with a focus on innovative concept such as deep learning, 6 G network, IOT, electric vehicle etc. It underlines how essential it is to collaborate cyber security and sustainable urban planning so as to ensure the privileges and wellbeing of citizens. By doing comprehensive

investigation and assessment of probable future technical frameworks and environmental aspects, the study aims to pave the way for sustainable living by handling existing technologies.

As an urgent initial phase in creating smart metropolitan organizations that have the capability on great and economical cycles, A.T. Hoang et al. (2021) advocate for the consolidation of harmless to the ecosystem power sources into energy frameworks. To lessen continuous contamination and further enhance resource ability in metropolitan circumstances, the appraisal features the need for acceptable power coordination. Sunlight-based, wind-based, and hydroelectric power are sustainable power sources that metropolitan populations might zero in on to lessen their dependence on oil products. Along these lines, they can battle environmental change and the consumption of the ozone layer. The defenders contend that this advance toward efficient power energy advances monetary development and social accomplishment as well as improving natural sensibility. This study reveals insight into how incorporating sustainable power developments could improve energy effectiveness, invigorate metropolitan areas, and increment the prosperity of city inhabitants from the perspective of canny urban development.

D.J. Sailor et al. (2021) investigated the links between photovoltaic energy and urban environments based on an analysis 116 studies. It emphasizes two main findings: photovoltaic system can significantly warm cities in the day, cool them at night, and potentially boost air conditioning energy use across certain climates and building types. Likewise, urban areas may hinder photovoltaic efficiency for as much as twentieth percent as opposed to rural locations. The study reveals that future photovoltaic technologies ought to focus on improving efficiency and reflecting untapped wavelengths. It also implies that urban photovoltaic system designs must consider the impacts of high temperatures, emissions, and shade on performance.

A. Jain (2020) utilized solar-powered street lamps as an imaginative and harmless answer to the ecosystem in cities. Zeroing in on functional purposes, the examination looks at how well solar street lighting systems can address the energy challenges that metropolitan populations face. Urban areas can decrease their dependence on conventional organization-based power and, thusly, the results and energy costs related to petroleum derivatives by utilizing solar energy to control streetlamps. Moreover, solar-powered streetlamps provide improved, solid quality and flexibility, particularly where power outages or cross-section disappointments are normal. Notwithstanding their verifiable biological advantages, these structures contribute to the production of more secure, more energetic urban environments, upgrading neighborhood monetary development and public wellbeing. Jain explains the capability of solar-powered streetlamps as an obvious indicator of a sustainable urban premise through logical examinations and reasonable encounters, lining up with the more sweeping objectives of green and sparkling city drives.

R.K.R. Karduri, and C. Ananth (2020) examined the integration of smart grids in smart cities, with a spotlight on energy management, efficiency, and the utilization of renewable sources. In spite of tackling concerns like cyber security, privacy, interoperability, and the need of rigorous governance and policy mechanisms, it analyzes operational aspects including demand response, user engagement, and regulating energy demand and supply. Harnessing the entire potential of smart grids for sustainable urban power futures needs supportive policies and a strategic plan.

M. Ourahou et al. (2020) investigated the concept of smart grids and their ability to adapt the framework of renewable energy integration. To tackle carbon dioxide emissions, pollution, climate change, and energy security, a transition to renewable energy is needed. The study emphasizes the development of electric utility infrastructure, discriminating among traditional and smart grids. It deals with integrating renewable energy into smart grids, which calls for efficient grid control for energy management.

3. INTEGRATION OF SOLAR POWER IN URBAN AREAS

Urban solar power integration has emerged as a crucial process in the quest for sustainable energy arrangements, addressing growing energy demand while mitigating ecological impact. In relation to the integration of solar electricity in urban settings, this article delves deeply into the meaning of plan improvements and productivity enhancements. The study of state-of-the-art configuration approaches and mechanical headways becomes fundamental for comprehending the maximum capacity of solar energy in urban scenes as urban areas continue to increase and energy needs rise. There are numerous impediments to defeat while coordinating sun-oriented power in metropolitan conditions. Challenges incorporate bound spaces, concealing issues brought about by tall buildings, and staying aware of popular reflections. On the off chance that we can conquer these hindrances, we can release the idle capability of the spotless energy in our counterfeit climate. A huge part of the answer to these issues will come from arranged projects, which provide arrangements that increase energy capture and consistently coordinate sun-powered situated enhancements into the current metropolitan foundation. The mix of sunlight-powered chargers on building veneers screens the advancement of the essential game plan. This headway changes plans into dynamic energy makers by consistently organizing the flow of force in light of daylight with fundamental components. Slim-film, sunlight-based chargers, which produce power and increase because of advancement, improve tastefully satisfying metropolitan conditions.

They are deftly integrated into the designs of the past. Creating sun-based controlled windows and post-windows offers two benefits: standard light might flood inside spaces, and straightforward sun-oriented fuel cells produce power. This improvement decreases reliance on normal power sources and increases energy efficiency in metropolitan designs by taking care of the requirements for energy and inside lighting. The flexibility of sun-powered courses of action is exhibited by the joining of sun-oriented development into metropolitan development, like roads and street furniture. By harnessing solar energy from the asphalt surface, photovoltaic-equipped solar roadways contribute to sustainable urban development and the energy era.

The creation of lightweight, flexible solar boards creates more chances for urban solar integration. Urban areas can use more solar energy when these boards are arranged in erratic places like curved surfaces or transient shapes. While creative designs tackle aesthetic and spatial issues, productivity gains are equally important for the viability of solar power integration in cities. When it comes to increasing energy capture, storage, and distribution within the constraints of urban contexts, mechanical advancements play a critical role.

Research on solar cells is moving forward with the goal of increasing productivity and lowering production costs. The energy transformation productivity of solar boards can be significantly

increased by innovations like couple solar cells, perovskite-silicon cross breed cells, and multi-intersection cells, which make them more suitable for urban applications. Maintaining a sustainable energy supply in the face of solar power's discontinuity calls for effective planning. Technological developments in batteries, such as fast and high-limit batteries, contribute to the energy supply equilibrium in cities. Efficient energy storage is essential for meeting demand and ensuring a steady supply of electricity.

Ingenious frameworks facilitate the incorporation of solar energy into urban energy grids. Through constant data collection, Internet of Things devices, and artificial intelligence, intelligent lattices promote energy distribution, reduce transmission errors, and enhance the overall stability and adaptability of urban energy networks.

There is no greater significance for plan advancements and productivity improvements in the integration of solar electricity in metropolitan settings. Beyond the immediate environmental benefits, these advancements strengthen and prolong the manageability of urban foundations.

Urban towns can reduce their carbon footprint by implementing plan developments that regularly integrate solar advancements into their urban settings. Urban places can mitigate the effects of the regular energy age by utilizing ideal and sustainable power sources, contributing to global efforts to combat climate change.

Improvements in efficiency, such as better energy storage and intelligent matrix integration, increase the viability of urban solar farms financially. Increased productivity results in a higher return on investment over the lifetime of solar power systems, which attracts investors and governments alike. Sunlight-based power's social ramifications in urban communities advance ecological awareness and municipal commitment. Integrating sunlight based power into public or local area establishment's advances feasible energy rehearsals, points out significant worries, and gets individuals engaged with the spotless energy progress.

4. CHALLENGES IN URBAN SOLAR POWER INTEGRATION

Metropolitan sun-oriented power offers a manageable energy choice, yet there are a ton of snags to survive and groundbreaking thoughts expected to make it work. Difficulties, for example, space limitations, security stresses, popular reflections, and high energy premiums, are researched in this review. It likewise makes sense of the difficulties that accomplices have while attempting to find the best, most eco-accommodating power course of action. Joining sunlight-based power in urban communities is blocked by an absence of open space, among other things.

Thick establishments depict the metropolitan climate, successfully shutting out immense sun-powered arrangements. Dissimilar to their rustic partners, ground-mounted, sun-oriented properties don't necessarily work in city conditions. Thusly, there ought to be gauge standards for plan changes that increase energy use within populated metropolitan districts. Future prospects incorporate sun-oriented board combinations into existing plans, like rooftops and building facades. The opportunities for sun-oriented power use in densely populated metropolitan regions are being extended by advancements in lightweight, adaptable sun-based sheets, which permit their coordination in high-level conditions.

A key variable restricting the viability of sunlight-based power frameworks in city conditions is their imperceptibility. In any event, during the most brilliant pieces of the day, sun-oriented sheets can have their viability diminished by shadows cast by buildings, trees, and different snags. This undertaking turns out to be more difficult while considering the excellent idea of city seeing, where the course and power of shadows change during the day. To make quick work of things, you want to utilize various techniques. Advancements in arranging, for example, sun-oriented fuelled board moving and worldwide situating frameworks raise the characteristic of sheets to increase day lighting. Moreover, improvements in avoid diode innovation help to control the effect of concealing on sun-oriented bunch execution, guaranteeing that the power age stays hearty, paying little mind to varieties in lighting. There is a plan and a challenge to coordinating solar-based innovations into cityscapes.

Metropolitan sun-oriented power frameworks depend intensely on individual inclination with regards to acknowledgment and adequacy. To conquer resistance from partners that focus on the stylish consciousness of the metropolitan climate, achieving a specific degree of harmony among usefulness and style is fundamental. One illustration of a vibe-focused plan development is sun-oriented sheets, which emulate the presence of more conventional building materials like sun-powered tiles and shingles. Moreover, inventive sun-powered-based associations and sun-oriented controlled energized street furniture are instances of how sun-arranged advancements can be integrated into metropolitan foundations, changing functional components into stylishly satisfying central places. Modelers and specialists should cooperate to integrate plans that depend on daylight into the metropolitan surface consistently. Metropolitan regions are centers of extreme interest in energy because of the convergence of individuals, organizations, and business action.

The test is to supply this consistently developing prerequisite sensibly. Even if solar energy is the best option for energy, solar institutions' adaptability to meet the growing demand for energy in cities is still remarkable. Dealing with the expanded interest in energy requires a thorough methodology that incorporates solar-powered energy with energy efficiency procedures and other energy sources. In cities, optimizing energy allocation and managing peak demand require savvy network developments, demand response mechanisms, and energy storage plans. Moreover, to achieve congruity in the natural market, technique structures that advance the reception of sun-oriented innovation and further develop energy assurance are essential.

The integration of solar power into urban areas raises a number of complex issues that necessitate a comprehensive strategy that incorporates mechanical development, urban preparation, and cooperative partner efforts. Imperatives on space, intrusions on security, uncomplimentary reflections, and inordinate energy utilization are developing issues as urban communities keep on developing. By addressing these issues head-on, it becomes feasible and essential to move toward a sustainable urban energy landscape powered by solar energy for a stronger and more environmentally friendly future.

5. OPPORTUNITIES IN URBAN SOLAR POWER INTEGRATION

Integrating solar-based power into urban communities fills a significant hole in the worldwide shift to cleaner energy. You can exploit the continuous foundation, which is a significant advantage. In

metropolitan areas, you can see buildings with solid walls that have adequate space on top to introduce sunlight-based sheets. More grounds are typically important in rustic or rural areas, although this raises doubt about that need.

The metropolitan people have a remarkable chance to transform housetops into dynamic energy generators by using a resource that has never been seen. By protecting biodiversity and green spaces, these increase metropolitan proficiency while moderating the normal outcomes of changing area use. Moreover, sunlight-based energy absorption into metropolitan environmental elements is related to the advancing pattern of maintainable metropolitan turn of events. Sustainable power sources, like sunlight-based power, are acquiring significance as city inhabitants endeavor to reduce their effect on the climate and battle against environmental change. By creating clean power on a local scale, metropolitan sun-oriented organizations further develop air quality and diminish outflows of ozone-draining substances.

The whole advancement is refreshed here to flourish the city occupants. Along these lines, dispersed solar-based power frameworks give energy adaptability by diminishing dependence on hurtfully concentrated power structures. The improvement of creative sunlight-based advances and building-integrated photovoltaic (BIPV) fills a further significant need in the business. Sun-powered sheets are ordinarily utilized in building integrated photovoltaic (BIPV) frameworks; they are stylishly satisfying and practically valuable. These advancements work on the elegance of city life, yet they likewise empower boundless gathering by settling issues with building feel and plan adaptability.

Besides, metropolitan sun-based incorporation couldn't provide more clear monetary benefits. Work that opens doors in a few areas, including creation, foundation, support, and imaginative work, is made by the extension of sun-situated organizations. The interest in gifted work is developing alongside the interest in solar items and administrations, setting out business doors and advancing financial development. Furthermore, solar-powered organizations could urge buyers to contribute assets through lower energy costs and conceivably state motivating forces or apportionments to advance naturally mindful power gathering.

Urban solar power integration offers a modern chance to handle squeezing natural, social, and monetary issues. Using the establishments currently set up, cultivating development, and advancing sustainable urban development, cities might harness the sun's plentiful energy potential to assemble versatile, low-carbon networks for what's to come.

6. RECENT SCHEMES RELATED TO SOLAR SYSTEM INSTALLATION

These are a few recent schemes using solar system installations:

- 1. Government Subsidies and Incentives:** Subsidies and incentives are given by numerous governments overall to advance the development of solar power installations. These can appear as tax cuts, refunds, or feed-in levies, which repay individuals or organizations for additional power they produce and send once more into the system.
- 2. Community Solar Programs:** Communities can pool their assets to invest in solar energy projects thanks to these schemes. Either leasing boards or subscribing to a piece of the solar

system's result are choices accessible to members, who regularly get credits for the energy created on their electricity bills.

3. **Net Metering Policies:** Solar system proprietors can sell any additional electricity created by their boards back to the framework using net metering. At the point when solar creation is low (around evening time, for instance), the system proprietor gets credit for the electricity they supply to the lattice, offsetting the electricity they consume from the framework.
4. **Solar Financing Programs:** In request to increase the openness of solar systems, various financing techniques have been grown, for example, power buy arrangements (PPAs), solar leasing, and green credits. Through these programs, individuals and organizations can install solar systems for practically zero cash front and center and afterward pay for the system over the long haul by saving cash on their electricity bills.
5. **Solar for Low-Income Communities:** Certain programs focus on offering solar energy answers for communities or individuals with low incomes. By lowering energy uses for individuals who could somehow spend a bigger level of their income on energy, these programs desire to increase energy affordability and sustainability.
6. **Solar Installation Training and Certification Programs:** Professionals with the essential abilities are popular because of the increasing interest for solar systems. Solar system plan, installation, and maintenance are subjects canvassed in an extensive variety of training and certification programs presented by numerous associations, community universities, and professional institutions.

As governments, associations, and communities work to support the utilization of solar energy and make the shift to a more sustainable energy future, these programs are continuously changing.

7. SOLAR CITIES PROGRAMME

The Solar Cities Program will encompass all Smart Cities. With a focus on creating a renewable energy cell for all smart cities, the initiative recalls-

- Smart Energy
- Renewable Energy Generation
- Smart Meters
- Assured electricity supply
- Smart Buildings
- Smart Waste Management
- Sustainable Environment

Solar power generation, solar traffic lights, solar street lighting, solar water heaters, solar photovoltaic rooftop systems, solar pumps, and solar concentrators for steam-based cooking are all features of the Smart Cities.

1. Roadmap for Solar Power by 2022

The entire 100 GW solar electricity can be utilized in solar parks, on ranches by ranchers, in private areas, by public authorities, and on solar rooftops. Figure 1 makes it evident that the solar rooftop system is capable of producing the most electricity.

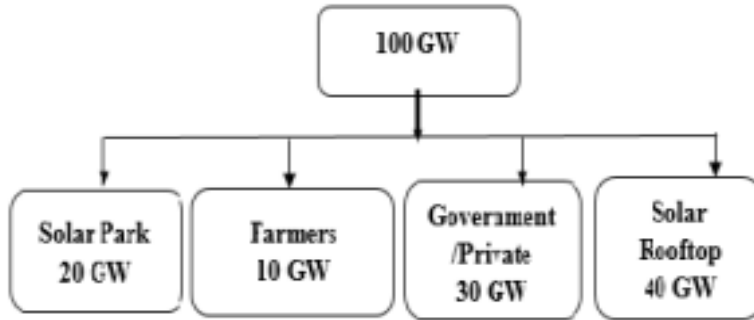


Figure 1: Roadmap of Solar Power

2. Solar Power Installation Capacities of the selected states of India

Table 1 lists the maximum solar power establishment limits for ten of India's most anticipated regions. Rajasthan has the most stringent establishment restriction, at 1200.9 MW. Gujarat continues to hold the second spot with 1001.67MW.

Table 1: Installation capacity of solar power

State	Solar Power Installation Capacity (MW)
Uttar Pradesh	72.58
Telangana	78.27
Tamil Nadu	158.99
Rajasthan	1200.9
Punjab	201.34
Odisha	57.94
Maharashtra	379.9
Madhya Pradesh	674.60
Gujarat	1001.67
Andhra Pradesh	280.16

8. FUTURISTIC TRENDS AND EVOLVING TECHNOLOGIES

Urban solar integration has a promising future ahead of it as global cooperation, legislative shifts, technical breakthroughs, and community involvement come together to cultivate sustainable energy landscapes. The foreseeable future of urban solar integration, centered on boosting the usage of solar energy in urban areas while lowering costs and improving efficiency, will be significantly influenced by the advancement of solar technologies. As opposed to traditional silicon-based cells, innovations like perovskite solar cells offer higher efficiency and cheaper production costs. Additionally, inventions in solar thermal technologies, such as concentrated solar power (CSP), are acquiring momentum. CSP systems use mirrors or lenses which reflect the

sunlight and generate heat, that can be turned into electrical energy. This makes it possible reliable power output and energy storage during instances of low sunlight.

The future of urban solar integration is significantly impacted by changing legislation and regulations influencing energy generation. In pursuit of sustainability goals, governments and municipalities are promoting solar installations in greater numbers. They draw attention to simplified regulations, monetary incentives, and offering explicit guidelines for incorporating solar energy into urban design. Private investment in solar projects is being encouraged by increasingly prevalent measures such as feed-in tariffs, net metering and tax incentives, which reimburse solar system users for surplus energy fed back into the grid.

Public understanding and civic involvement are also key to the future of urban solar integration. Fostering an impression of ownership and awareness throughout societies is of paramount importance as solar installations proliferate. Future prospects imply decentralized energy systems where local people are actively involved and earn from solar energy ventures. Enabling society to embrace urban solar integration entails training sessions, grassroots outreach, and collaborative decision-making. By immersing locals in making the switch to clean energy while offering them the requisite resources and knowledge, localities are better able to promote sustainability while contributing to the sustainability goals associated with urban solar power projects.

The probable future of urban solar integration is anticipated to be significantly impacted by international collaboration and the sharing of best practices. As urban areas around the globe confront identical energy-related issues, collaboration in research, innovation in technology, and establishing policies become imperative. With international alliances, knowledge and experiences may be shared more readily, allowing urban areas to address similar challenges while gaining insight from successful implementations. Fostering best practices for promoting the adoption of solar energy in urban areas involves swapping knowledge on revolutionary technologies, suitable regulations, and measures for engaging the community. International conferences and workshops are used as an arena for the sharing of ideas and the building of a worldwide community devoted to the progression of sustainable urban energy solutions. Urban cities might get more connected to a unified vision of urban sustainability just by learning lessons from each other's triumphs and setbacks.

Urban solar integration seems to be a dynamic mix of international collaboration, civic engagement, legislative evolution, and technological advances in the future. Sustainable urban energy landscape formation needs the integration of future solar technology, supportive regulations, knowledgeable communities, and collective initiatives. Urban areas will find themselves at the cutting edge of the clean energy transition if they recognize new trends and technologies, explore evolving policies, permit community involvement, and collaborate internationally. This will add to making cities close to the globe more sustainable and resilient in the future.

9. RECOMMENDATIONS

The integration of solar energy in urban environments has massive potential due to pioneering concepts and efficiency advancements that are vital for sustainable development. Unrelenting

investment in research and development by governments, educational institutions, and industry traitors is indispensable to enhancing solar technology, rendering it more efficient, economical, and fit for urban areas. Policymakers ought to encourage solar adoption, shorten permitting procedures, and subsidize solar programs. To come up with inclusive approaches that deal with space, design, and efficiency issues, designers, engineers, urban planners, policymakers, and inhabitants have to collaborate. To foster stewardship and shared accountability, it is vital that communities be trained and involving in decision-making. Campaigns for the general public may aid in uncover and showcasing the positive aspects of solar technologies. Global collaboration is also critical for spreading best practices and addressing global concerns relating to urban solar integration. Across the globe, collaborative research endeavors and shared knowledge forums make possible the advent of sustainable urban energy solutions.

10. CONCLUSION

The examination of plan advances and efficiency improvements in the integration of solar power within urban areas enlightens a way towards an additional hearty and sustainable urban future. Consolidating mechanical movements, compositional vision, and neighborhood shows how solar energy might change urban environments. Solar energy can be utilized to develop solar-smart cities in a productive manner. Regardless of its numerous obstructions, incorporating solar energy into urban environmental elements is by and large a significant step toward sustainable development. Urban areas can transform necessities into opportunities by embracing imaginative techniques and applying mechanical progression. This will lessen the side effects of petroleum derivatives, increase energy adaptability, and advance financial development. In any case, acknowledgment of these advantages relies upon the conscious endeavors of accomplices, organizations, and lawmakers to execute functional arrangements, supporting components, and comprehensive responsibility structures. Eventually, fruitful solar energy integration in urban settings guarantees a more grounded and sustainable future for people.

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