



EVALUATION OF THE NATIONAL SOLAR MISSION SINCE ITS INCEPTION IN ACHIEVING ITS OBJECTIVES.

RESEARCHER DETAILS

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ABSTRACT

The paper tries to analyze one of the most important initiatives by government of India for tackling the issue of climate change i.e. National action plan for climate change (NAPCC). As climate change is a multi dimensional topic so the government has tried to cover all aspects in NAPCC .Consequently, NAPCC has many sub-schemes pertaining to various aspects of environment such as air, land, water, etc. Owing to this fact, this paper tries to explain and analyze National solar missions outcome and tries to point out the bottlenecks existing in the scheme .This paper also tries to bring forth suggestion regarding solar policies.

Keywords – NAPCC, National Solar Mission, Climate Change, Solar Policies

INTRODUCTION

Climate change has been causing havoc all round the world, especially in green policy making circles. So it's quite relevant to know the term with certain depth. According to the researchers, scientists, environmentalists, etc, climate change is the umbrella of events such as increase in average temperature globe, abrupt climatic fluctuations, loss of biodiversity, melting of ice caps, etc .To sum it up , almost all scientists agree that these events are mainly been caused by the sudden rise of global temperatures due to carbon emissions throughout the world. And the increased emissions have been attributed to the race of industrialization among the countries. This race has caused massive exploitation of natural resources such as forest, land, etc which further aggravated the problem. Deforestation and desertification has caused harm to the replenishing impact of environment as forests are the natural carbon absorber (i.e. carbon sequestration).

Various reports have been published cautioning the world about the menace of rising temperatures. Major body to collate all such reports and publish one credible report is IPCC. IPCC comes under UNFCCC (United Nations Framework for Climate Change) and acts as its research wing to provide platform for all climate change researches and findings. The report published by the Intergovernmental Panel on Climate Change (IPCC) recently underscores that unless we reduce greenhouse-gas emissions by at least 43% this decade, we are locking ourselves into a future of escalating climate extremes, food crises, and nature loss (Stieglitz, 2023). As one can see that the issue is global so there has to be global effort to tackle the problem. So, global community first came together in Rio Earth Summit in 1992 to decide upon the environment protection agenda for the world. It included delegates from 176 countries who brainstormed over the issues and came up with 3 documents – 1) Agenda 21 2) Rio declaration 3) Forest principles. It also led to formation of 3 bodies namely UNCCD (United Nations Convention to Combat Desertification), UN CBD (UN Convention on Combating Climate Change) and UNFCCC (UN Framework Convention on Climate Change). This started the journey of global collaboration. After this, Kyoto Protocol was tabled for signatures of nations from 1997 and achieved the signatures from 196 countries. It came into effect from 2005 and its first phase lasted for 2012. In this phase, Annex B countries (comprised of developed nations) were given binding commitments and placed heavier burden of compliance under the principle of “common but differentiated responsibility”. In its Annex B, the Kyoto Protocol sets binding emission reduction targets for 37 industrialized countries and economies in transition and the European Union. Overall, these targets add up to an average 5 per cent emission reduction compared to 1990 levels over the five year period 2008–2012 (the first commitment period) (UNFCCC, 2023). Then in 2012, DOHA amendment was brought by UNFCCC in which new commitments were given to the industrialized countries which now committed to cut carbon emissions by 18% in period 2013 – 2020. 147 countries have signed it till 2020 so now it's in force. Commitment period may be revised now. Major mechanisms in Kyoto Protocol were Joint Implementation, Clean Development Mechanism and Emission Trading. Registry system keeps records of the transaction between countries under the above mechanisms. An Adaptation Fund was established to fund the climate resilient projects. (UNFCCC, 2023)

Another major global effort that came to forth was the Paris Climate Deal that was introduced in COP 21 in Paris of UNFCCC. It was signed by 196 members. It is a legally binding treaty which targets to restrict the rise in temperature to less than 2 degree centigrade increase from pre industrial level up till the end of the century (i.e. 2100) and pursue effort to restrict the rise to 1.5 degree centigrade till 2100. It involved voluntary goal declarations by nations known as “Nationally Determined Contributions”. As a novel feature, “Enhanced Transparency Framework” was introduced which mandates countries to transparently show their carbon reduction efforts in 2024. Also third party financing was allowed. As a result of these efforts, zero carbon solutions are becoming competitive in the economic sectors representing 25% of the carbon emissions. By 2030, this number is supposed to reach 70%. (UNFCCC, 2023).

A brief history

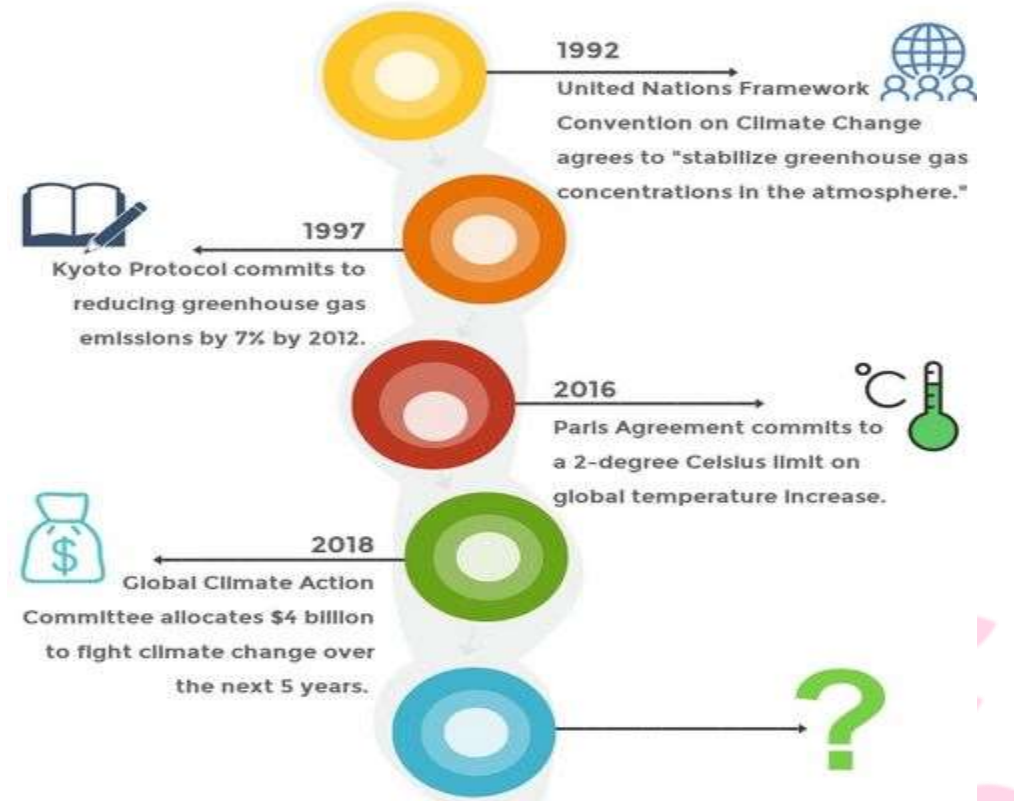


Image Credit: (civildaily, 2020)

RESEARCH OBJECTIVES

- A) Evaluate the National Solar Mission's overall performance and progress in terms of installed capacity, generation, and carbon emission reduction.
- B) Assess the cost-effectiveness and economic viability of solar energy production in the context of the mission.
- C) List the important legislative and administrative elements that have affected the mission's execution and success.
- D) Examine the social and environmental impacts of the National Solar Mission.
- E) Analyze the challenges faced by stakeholders and suggest strategies for enhancing the mission's effectiveness.
- F) Provide recommendations for policy improvements and future directions of the National Solar Mission.

INDIAN EFFORTS FOR CLIMATE CHANGE IMPACT MITIGATION

Government of India ratified the Kyoto protocol in 2002. However, as we know that India was exempted from the bonding regulations which was posed on annex B countries (mainly comprised of developed nations). Despite this fact, Indian government has launched an overarching scheme to tackle the climate change issue. The name of that scheme was National Action Plan on Climate Change. It consists of 8 sub schemes namely

- National Solar Mission
- National Mission for Enhanced Energy Efficiency
- National Mission on Sustainable Habitat
- National Water Mission
- National Mission for Sustaining the Himalayan Ecosystem
- National Mission for a Green India
- National Mission for Sustainable Agriculture
- National Mission on Strategic Knowledge for Climate Change (pib, 2022).

The primary objectives of these schemes can be underlined as such

- 1) Protection of vulnerable sections such as poor disadvantaged sections from the impact of climate change.
- 2) Achieve economic growth through climate sensitive techniques.
- 3) Adopting technology for mitigation and adaption according to the climate change
- 4) Inclusion of civil societies in the projects and employing public-private partnership as a tool.
- 5) Designing new innovative market, regulatory and policy to tackle the issue of climate change.
- 6) International cooperation for R&D and transfer of technology for being always in touch with cutting edge climate friendly technologies. (pib, 2022)

In line with the NAPCC, states has also initiated State Action Plan on Climate Change in which they try to outline different project and efforts towards the fight against the climate change issue at state level.

Now I will put down the basic objectives of these schemes and try to analyse what results these schemes have achieved on their scale of achievement.

National Solar Mission

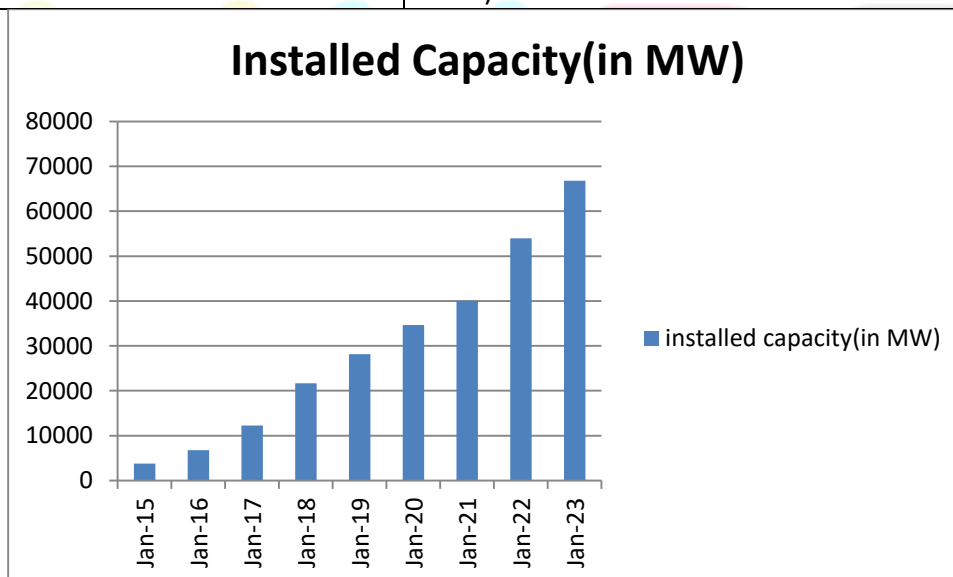
In the tropical nation of India, the sun shines brighter and for a longer period of time each day. Depending on location, the average daily solar energy incident over India ranges from 4 to 7 kWh/meter square and there are roughly 1500–2000 hours of sunshine per year, producing an annual total incident radiation of about 5000 trillion kWh. This exceeds the current overall energy use by an excessive amount. As a result, solar energy has a lot of potential as a future energy source.

Initially under the name of Jawaharlal Nehru national solar mission, Government had set the target to achieve the target of installations of 20 GW solar producing infrastructures. But in 2015, Government revised it to 100 GW. Out of these 100 GW, 40 GW had to be achieved through Roof Top solar system and 60 from large and medium grid-connected solar projects. Secondly, It aims to reach a solar

thermal collector area of 15 million square meters by 2017 and 20 million by 2022. Thirdly, It aims to install 20 million solar lighting installations in rural region (byjus, 2023).

Table :1 - Year wise expansion of solar installed capacities

Status till	Installed capacity (in MW)
March 2015	3743.97 (authority c. e., 2015)
March 2016	6762.85 (authority, ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS, 2016)
March 2017	12288.83 (authority, ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS, 2017)
March 2018	21651.48 (authority, 2018; authority, ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS, 2018)
March 2019	28180.71 (authority, ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS, 2019)
March 2020	34627.82 (authority, ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS, 2020)
March 2021	40085.37 (authority, ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS, 2021)
March 2022	53996.54 (authority, ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS, 2022)
March 2023	66780.34 (authority, ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS, 2023)



Graph 1:- Installed Solar Capacity

National solar mission envisaged both on grid and off grid solar installations. Off grid installations were done under the sub-scheme of off-grid and decentralized solar PV application program. In its first phase (2010-13), it targeted 200 MW installations. In its 2nd phase (2013-17), I targeted 500MW. In its present 3rd phase ,it targeted 118 MW, excluding the installations of solar pumps under the PM KUSUM scheme and installation of home lights under saubhagya scheme.

Phase III of the Off-Grid and Distributed Solar Applications Program includes the following components:

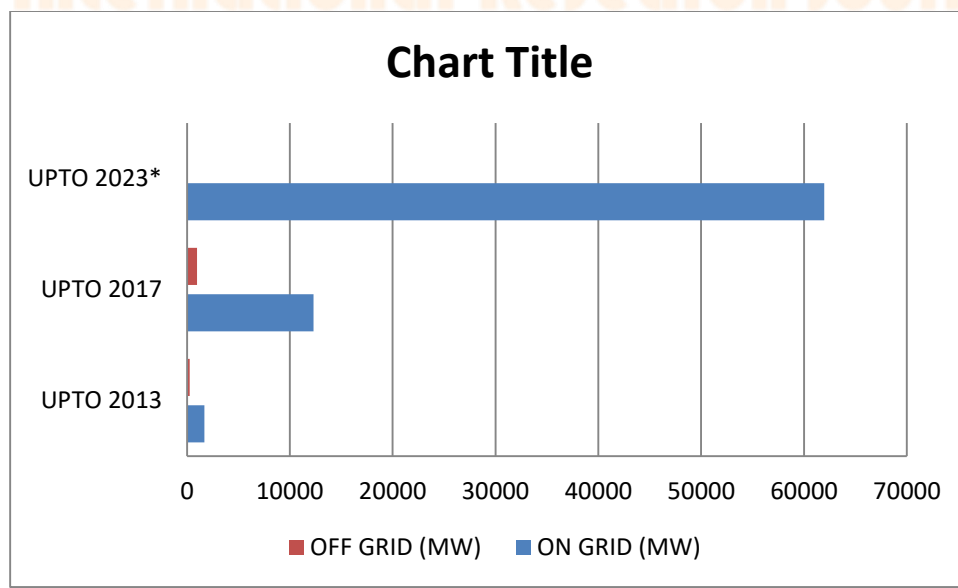
i) **Solar Street Light** : Three million solar streetlights will be installed across the country, with a particular focus on areas without a mains streetlight system option, as well as in northeastern states and left-wing extremist (LWE)-affected counties.

ii) **Standalone Power Plant** : Solar power plants up to 25 kWp (kilowatt peak) will be funded in areas with poor or unreliable grid supply. This component is mainly used for powering schools, dormitories, panchayat, police stations and other public facilities. The total output of the solar power plant will be 100 MWp.

iii) **Solar Study Lamp**: 25 million solar study lamps will be deployed in northeastern states and LWE-affected counties. Solar street lights and solar power plants will be provided with financial support of up to 30% of the system's benchmark cost. However, North East, Hill States, and Island UTs offer up to 90% of the benchmark cost.

YEAR	ON GRID(MW)	OFF GRID(MW)
UPTO 2013	1684.46	253
UPTO 2017	12288.9	966
UPTO 2023	61966.4	***

Data source: (MNRE, 2022)



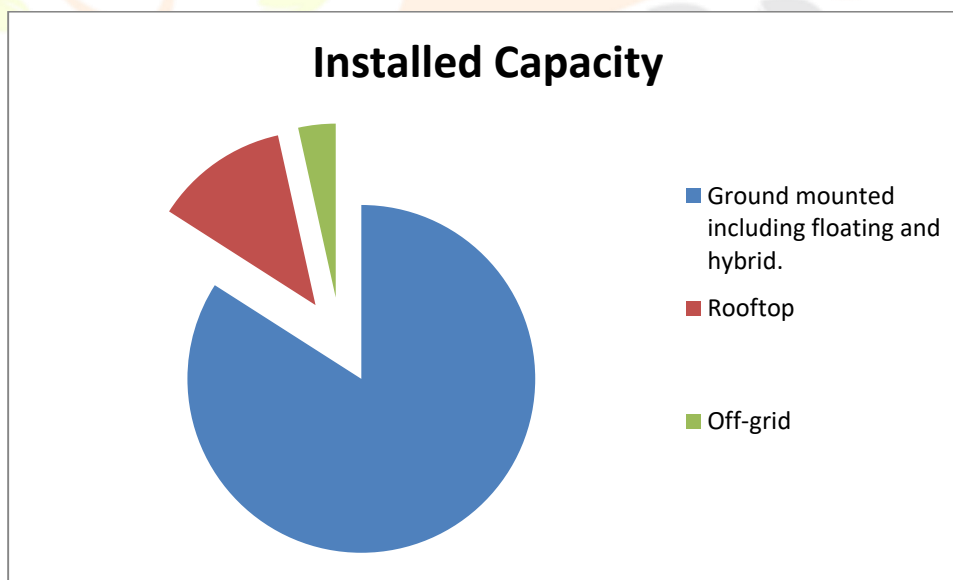
GRAPH 2: ONGRID AND OFF GRID SOLAR INSTALLATIONS

INTERPRETATION

Off grid and solar PV application program is running according to the required pace. In first two phases it crossed the earmarked target. After 3rd phase, a change has been brought to exclude the installation of solar pumps from the ambit of the program. The installation of solar-pumps are to be carried out by PM KUSUM scheme

Application	Installed capacity(MW)
Ground mounted including floating and hybrid.	55,387.00
Rooftop	8,218.00
Off-grid	2,288.00
TOTAL	65893

TABLE 3 - Photovoltaic (PV) installed capacity by application (MWAC)



GRAPH 3 - Photovoltaic (PV) installed capacity by application (MWAC)

INTERPRETATION

Rooftop solar system is not installed in line with the ambitions laid out. A report of economic times quoted "A parliamentary panel has attributed low installation of solar roof-top and wind energy projects as key reasons for the shortfall in achieving India's renewable energy capacity target of 175 GW by 2022. India set an ambitious target of installing 175 GW of renewable energy capacity by the year 2022, which included 100

GW from solar, 60 GW from wind, 10 GW from bio-power and 5 GW from small hydro-power.”Clearly rooftop solar installation is lagging behind the target as target of rooftop installation has been increased to 40 GW till 2026.

CONCLUSION

Finally, the assessment of the National Solar Mission's performance up to 2022 identifies both noteworthy accomplishments and areas that need improvement. The mission has achieved considerable strides in encouraging the use of solar energy and has aided in the expansion of the nation's renewable energy industry. The capacity of solar power installations has increased significantly, exceeding early goals and reflecting the government's commitment to clean and sustainable energy.

The National Solar Mission's lowering of solar power tariffs, which has increased its cost-competitiveness with conventional energy sources, is one of its major accomplishments. As a result, the private sector has been encouraged to participate more and a favourable atmosphere has been established for investments in solar energy projects.

But there are some areas that need attention and development. To support the increasing capacity of solar energy installations, the distribution and transmission infrastructure has to be improved. This entails improving grid integration, addressing difficulties with intermittency, and updating the infrastructure for power evacuation in areas with abundant solar energy. Additionally, prompt payments to solar power producers and simplified regulatory procedures would inspire investor confidence and increase involvement from the private sector.

As per the government official release, It stated certain specific reasons for the lagging behind in the rooftop solar installations. As per PIB report , government stated “Apart from reasons such as apprehension of possible revenue loss to DISCOMs, delay in approvals and installation of net/gross meters by DISCOMs, lack of uniform regulations, lack of awareness, etc., the implementation of the Program has been significantly affected due to Covid-19 pandemic and DISCOMs/ State Implementing Agencies have sought extension in the time-line for execution of projects under the Program. Ministry has also conducted third party evaluation of the Program and based on the recommendations, the Program has been extended till 31.3.2026.” (PIB, 2022)

Several actions might be taken to improve the National Solar Mission's performance even further. To track the mission's progress and effect periodically, a strong monitoring and evaluation system must first be established. By doing so, it will be easier to spot bottlenecks, evaluate how well established policies are working, and come to wise conclusions about future planning.

Second, research and development in solar energy technology should receive more attention. This will encourage innovation, boost productivity, and result in cost savings, making solar electricity even more accessible and inexpensive. Collaboration with academic institutions, business leaders, and foreign partners may help the nation's solar technology progress.

Thirdly, the government should keep offering incentives and policy assistance to encourage the use of solar energy. This entails making sure that legislative frameworks are solid and long-lasting, making financing choices more accessible, and encouraging the use of solar energy in areas like transportation, industry, and agriculture.

Last but not least, it is important to launch public awareness efforts and educational programs to increase knowledge of solar energy's advantages and promote individual and group adoption. This may be accomplished by promoting solar energy literacy through targeted outreach initiatives, educational seminars, and public-private collaborations.

The National Solar Mission can overcome current obstacles, build on its successes, and hasten the expansion of solar energy throughout the nation by putting these strategies into practice. In addition to enhancing India's energy security, this would lessen the negative consequences of climate change and advance sustainable development. The National Solar Mission has established a solid foundation, and with continuous dedication and teamwork, India can become a worldwide leader in the deployment of solar energy.

REFERENCES

authority, c. e. (2020). ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS. Delhi: central electricity authority.

authority, c. e. (2021). ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS. Delhi: central electricity authority.

authority, c. e. (2015). ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS. delhi: central electricity authority.

authority, c. e. (2016). ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS. delhi: central electricity authority.

authority, c. e. (2017). ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS. delhi: central electricity authority.

authority, c. e. (2018). ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS. Delhi: https://cea.nic.in/wp-content/uploads/2020/02/installed_capacity-03-3.pdf.

- authority, c. e. (2019). ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS. Delhi: https://cea.nic.in/wp-content/uploads/2020/02/installed_capacity-03-4.pdf.
- authority, c. e. (2022). ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS. delhi: central electricity authority.
- authority, c. e. (2023). ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS. delhi: central electricity authority.
- byjus. (2023, january 1). byjus. Retrieved april 23, 2023, from <https://byjus.com/free-ias-prep/national-solar-mission/>: <https://byjus.com/free-ias-prep/national-solar-mission/>
- cea. (2016). ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS. delhi: cea.nic.in.
- civildaily. (2020, december 10). <https://www.civildaily.com/news/a-history-of-climate-change-negotiations/>. Retrieved april 16, 2023, from <https://www.civildaily.com/news/a-history-of-climate-change-negotiations/>: <https://www.civildaily.com/news/a-history-of-climate-change-negotiations/>
- MNRE. (2022). on grid and off grid. DELHI: MNRE.
- pib. (2022, March 28). Retrieved April 16, 2023, from <https://www.pib.gov.in/PressReleasePage.aspx?PRID=1810566>: <https://www.pib.gov.in/PressReleasePage.aspx?PRID=1810566>
- PIB. (2022). Rooftop Solar Programme Phase-II to extract green energy from Rooftop solar sector. Delhi: PIB.
- stiell, s. (2023, March 20). Time. Retrieved April 14, 2023, from <https://time.com/6264659/lessons-from-the-new-u-n-climate-report-on-how-to-course-correct/>
- unfccc. (2023, january 1). <https://unfccc.int/process-and-meetings/the-paris-agreement>. Retrieved april 16, 2023, from unfccc.int: <https://unfccc.int/process-and-meetings/the-paris-agreement>
- unfccc. (2023, jan 1). UNFCCC>INT. Retrieved april 14, 2023, from https://unfccc.int/kyoto_protocol
- Parija, S. C., & Bobhate, P. S. (2022). Mitigating the Adverse Impact of Climate Change: An Indian Perspective. *SBV Journal of Basic, Clinical and Applied Health Science*, 5(4), 87-87.
- Akoijam, A. S., & Krishna, V. V. (2017). Exploring the Jawaharlal Nehru national solar mission (JNNSM): impact on innovation ecosystem in India. *African Journal of Science, Technology, Innovation and Development*, 9(5), 573-585