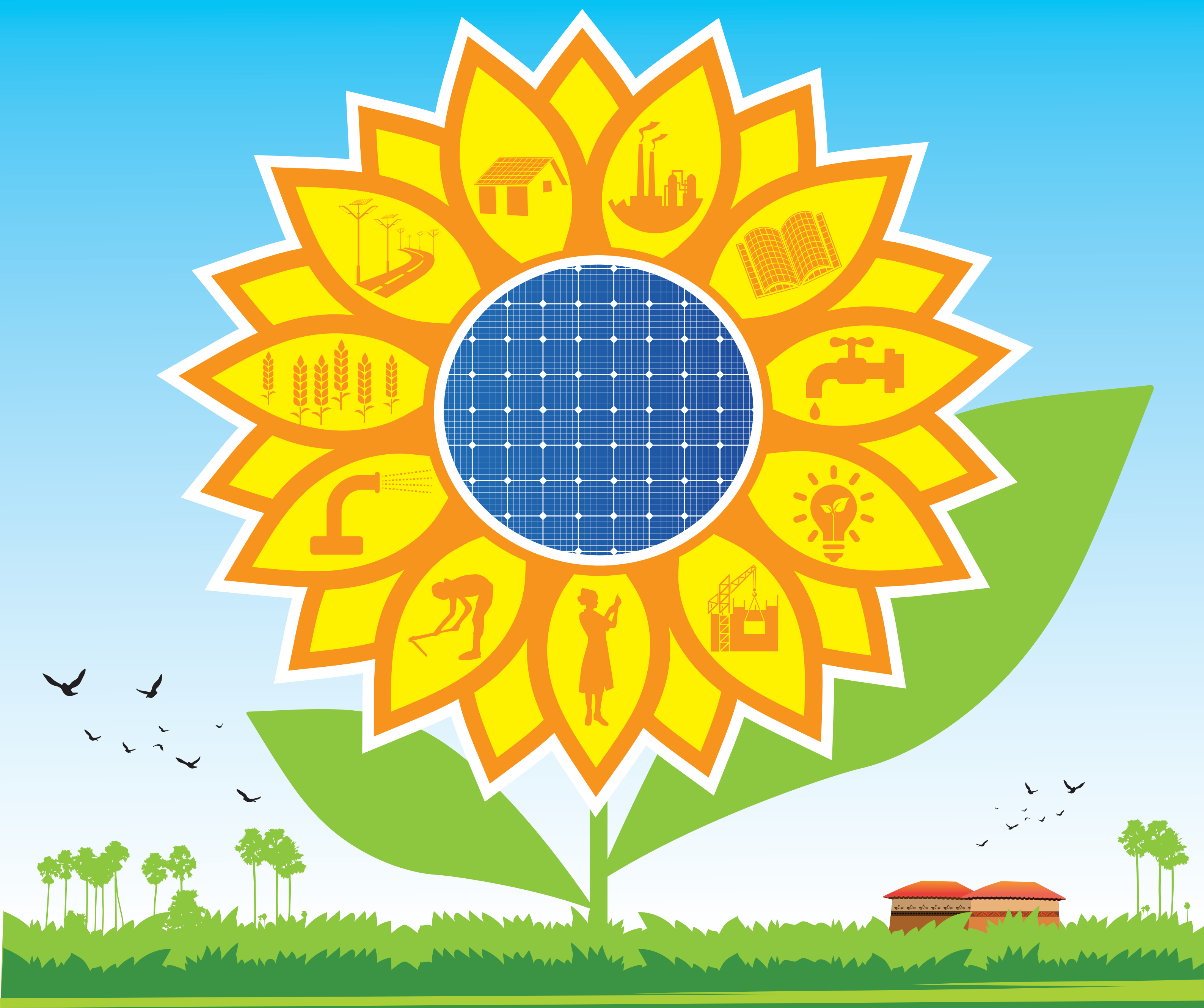
Empowering Bihar through DRE in the Post-COVID World

CEED 2021



ABOUT CEED

Centre for Environment and Energy Development (CEED), an environment and energy expert group, is involved in creating sustainable solutions to maintain a healthy, rich and diverse environment. CEED primarily works towards clean energy, clean air, clean water and zero waste solutions by creating an enabling ecosystem to scale up investments in low carbon development pathways, climate mitigation and adaptation. CEED engages with industries, think tanks, stakeholders and public to create environmentally responsible and socially just solutions.

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Shakti Sustainable Energy Foundation (SSEF)

Shakti Sustainable Energy Foundation seeks to facilitate India's transition to a sustainable energy future by aiding the design and implementation of policies in the areas of clean power, energy efficiency, sustainable urban transport, climate change mitigation and clean energy finance.

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Abbreviations

AT&C: Aggregate Technical & Commercial
PHED: Public Health Engineering Department
BREDA: Bihar Renewable Energy Development Agency
PMKSY: Pradhanmantri Krishi Sinchayee Yojna
BSWAN: Bihar State Wide Area Network
KUSUM: Krishi Urja Suraksha and Utthan Mahabhiyan
CBHS: Community Based Holistic Sanitation
ICT: Information and communications technology
DBT: Direct Benefits Transfer
MGNREGA: Mahatma Gandhi National Rural Employment Guarantee Act
DDUGJY: Deen Dayal Upadhyaya Gram Jyoti Yojana
MNRE: Ministry for New and Renewable Energy
DDU-GKY: Deen Dayal Upadhyaya Grameen Kaushalya Yojana
MW: Mega Watt
DISCOMs: Distribution Companies
NRLM: National Rural Livelihood Mission
DRE: Decentralise Renewable Energy
RE: Renewable Energy
FY: Financial Year
SDGs: Sustainable Development Goals
GW: Giga Watt
SMEs: Small and Medium-sized Enterprises
HDI: Human Development Index
SSLs: Solar Street Lights
HP: Horse Power
PMKVY: Pradhan Mantri Kaushal Vikas Yojana
ILO: International Labor Organisation
PMGSY: Pradhan Mantri Gram Sadak Yojana
PPP: Public Private Partnership
PMAY: Pradhan Mantri Awas Yojana
PHC: Primary Health Centres

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Executive Summary

Bihar is at the crossroad of a sustainable energy transition considering its renewable energy potential, new government in power after the state assembly election (2020), and the recurrent demands and expectations of reliable electricity on various socio-economic fronts. The energy pathways of Bihar will define its future growth trajectory, economic prosperity and livelihood opportunities. Due to the ripple effect created by the COVID-19 pandemic a huge challenge has emerged before the policy makers to constructively engage the unemployed workforce created by reverse migration. However, this challenge can be a boon in disguise considering a large pool of skilled and semi-skilled labour is required to strengthen the Decentralised Renewable Energy (DRE) projects in an array of activities such as manufacturing of the equipment; construction of power plants; and operation and maintenance at the sites.

As per the study done by CEED, **the DRE segment has a potential of 3948 MW, where the top 10 government departments can lead to 95% of the DRE Potential.** Furthermore, **the DRE will contribute in creating 1,71, 210 new jobs** in Bihar. This study also indicates that the **DRE has an investment potential of Rs. 36,738 Crore** in the state. The infusion of **DRE solutions across the government departments can avoid carbon emission in tune of 73,10,636 tonnes.** Thus, the DRE can be instrumental in ensuring growth trajectory with bringing in huge environmental co-benefits.

The broader findings of this report portrays an optimistic scenario for addressing several issues such as check on outer migration, enhancing the skill building, and emergence of a new set of livelihood opportunities in the non-farm segment particularly in small and micro enterprise activities. These changes subtly indicate a huge qualitative change can be brought in the socio-economic spheres of people's lives through ensuring energy security, additional income generation and livelihood security. Hence, the recommendations of this report suggest a more integrated approach for mainstreaming of DRE to revive the overall economy of Bihar in the post-COVID scenario.

The state assembly election of Bihar of 2020 has witnessed emphatic support for the DRE solutions among all prominent political parties, where the consistent campaigning and public engagement by the CEED forged a political consensus on DRE as a preferred climate solution to offset the impact of climate change and also bring in a new era of sustainability in development approach with rewriting the current energy paradigm. Now, the new state government is in place and the DRE is well positioned to recharge agriculture, health, business and service sectors of the economy.

This is the right time for recovery through green means and strongly moving towards the low-carbon pathways in the times of climate change impacts. For this, Bihar essentially needs a 'DRE Mission' that can be catalysed through the convergence of all aligned departments with a common vision to usher in a new era of sustainable future. The DRE is the path which can be instrumental in reducing poverty, improving health indicators, and ensuring well being of the people. Essentially, DRE is not just an energy option but a catalytic social initiative for transforming the lives of the masses at the bottom of the pyramid for realisation of a million of dreams to flourish.

Ramapati Kumar

Chief Executive Officer (CEO)

Centre for Environment and Energy Development (CEED)

Key Facts

1.71

Lakh new jobs creation
from DRE in Bihar

3948

MW potential
in DRE segment

36738

Crore of DRE investment
potential in the state

73

Lakh tonnes of Carbon emission can be
avoided through DRE deployment

10

Government Departments can
generate 95% of the DRE Potential

44

MW of current installed capacity in
DRE in the state

1. Introduction

1.1 Aim and Objectives of the Study

This study is a macroscopic assessment of potential jobs and opportunities in various sectors e.g. agriculture, industry, health, rural development, manufacturing, micro-enterprise and services from the perspective of the DRE for strengthening the rural economy in Bihar. This study intends to showcase the immense potentials located in various schemes and programs of selected departments of the Government of Bihar and it brings much needed spotlight on cleaner and greener energy options like DRE for motivating policy makers and key stakeholders to further move towards sustainable development pathways in the state.

In this connection, it is important to identify the existing gaps and take stock of the situations like how the interplay between risks, policies, and market developments have shaped capacity addition so far and how the combined impacts of the COVID-19 pandemic and reverse migration have created some opportunities amidst crisis at several fronts. This will help various stakeholders e.g. policymakers, regulators, developers, and investors assess the extent of the consistency between the current state of the DRE and Bihar's clean energy ambitions and identify the course corrections required to advance the goal of sustainable energy transition.

Situated in this context, the objectives of the study are indicated below :

- To map out the magnitude and trends of DRE potential exists in the government departments & schemes and provide the potential new job opportunities in various sectors where the migrant workers can be absorbed in significant ways

- To assess the existing policy measures and present key recommendations to bring in an ecosystem and enabling framework for increasing deployment of low-carbon and energy-efficient projects

1.2 Research Methodology and Scope of the Study

For a better understanding of the ground reality of the DRE sector and it's job prospect, a combination of primary and secondary research methods comprising semi-structured questionnaire survey, in-depth interviews and formal and informal interactions were undertaken with various stakeholders located in government, private sector and non-government realms. In this connection Energy Collective, a multi-stakeholder platform and network of CEED, acted like a connecting thread for the larger research related exercise.

For context setting, secondary literature review of past works and reports of various reputed organisations such as CEEW, Power4All, TERI, NDRC, SSEF, WRI, IRENA, Skill Council of India, ckinetics etc was done to analyse the overall ground situation. A series of interactions with various renewable energy developers (total number 45) were also conducted to get the better picture of DRE related development and issues in the state. Moreover, a random survey (total number 380) of returned migrant workers was also conducted to map out the existing skill force as well to assess the scale and current impact of reverse migration in the state in post-COVID-19 scenario. Furthermore, the analysis of various relief packages and schemes announced by the government for managing reverse migration was done to get a clear picture of the financing mechanisms and the scope of leading private financial institutions to promote the DRE models.

The analysis in this report is limited to direct jobs created through installation, operation and maintenance of the DRE solutions, and it does not include indirect jobs for example, those in the manufacturing, financing, and distribution companies, or induced jobs such as jobs created by earnings of workers employed in the renewable energy sector.

1.3 Energy and Development Scenario in Bihar

Bihar, with an area of 94,163 sq. km, is the 13th largest state in terms of size and 3rd largest in terms of population (Census-2011) in India. It is also one of the fastest growing states in the country that has seen a double digit growth rate continuously in recent years.[1] It is primarily an agrarian state where around 88% of its population (Census-2011) resides in the rural areas. Bihar is largely seen as an 'energy starved' state, however it has tried to erase this tag and made remarkable progress in energy and power scenario in recent times. However, meeting energy demands to various needs is one of the major challenges for the state for attaining higher growth and ensuring well being of the people. The per capita consumption in the state has risen from 145 kWh in 2012-13 to 311 kWh during 2018-19 implying a growth of 114 percent in six years.[2] Under 'Deen Dayal Upadhyaya Gram Jyoti Yojana' (DDUGJY), the rural electrification work has been completed in all 38 districts of the state, with all villages and habitat fully electrified.[3] The peak power demand of Bihar reached a new high of around 5,800 MW in 2019 as compared to mere 1300 MW in 2008-09 which is mostly met from energy purchased from central power stations, SEC, independent power producers, energy exchange and other power purchase agreements done with different states. The peak power demand of Bihar is estimated to go up around 10,000 MW in the next few years.

Energy security and access to electricity are inter aligned with Sustainable Development Goals (SDGs) adopted by the United Nations and they encompass several milestones for attaining overall development of the people and society. Energy is the node of modern human life which can be seen through various inter-linkages such as Energy, Poverty and Inequalities (SDGs 1, 10); Food, Water and Energy (SDGs 2, 6), Good Health (SDG 3), Energy and Education (SDG 4), Gender Equality (SDG 5), Decent work and monetary development (SDG 8), Industry, advancement and foundation (SDG 9 [4].

Considering Bihar as one of the prominent climate fragile states in India and a developing state which aspires for ensuring overall development of over 10 Crore people actually needs a holistic approach in prioritisation of energy sources in the wake of deepening climate change crisis and its disastrous effects. Here comes the role of DRE which brings a much needed futuristic solution for fulfilling various socio-economic and development needs in a sustainable manner.

2. Present Status of DRE in Bihar

Total numbers of DRE applications deployed : 19,95, 495
Total DRE installed capacity : 44 MW

Bihar has a potential of around 16000 MWp in Solar, 2150 MW in Biomass and only a marginal potential in wind.[5] Ministry for New and Renewable Energy (MNRE) estimates a potential of 11.2 GW from solar considering the state is blessed with a solar radiation of around 5 kWh/m2/day[6].

In 2017, the state government came forward with a first of its kind 'Bihar Policy for Promotion of New and Renewable Energy Sources-2017' that is inclusive and technology neutral with focus on each RE technology to harness around 3433 MW of clean energy in the next 5 years. However, despite several government efforts very little has been achieved so far and it stands at around 194 MW. The policy also has the provision for DRE, where 100 MW was set for mini grids but little progress has been achieved. Even the solar rooftop and solar pump installation stands at meagre 18.2 MW. However, a large number of DRE applications[7] [8] have been installed in the past years which is as illustrated below in Figure 1:

Figure 1 : DRE Applications in Bihar (Source: BREDA)

Sr. No.	Applications	Capacity (Nos./MW)
1.	Biogas Plants	30,924 Nos.
2.	Improved Chulhas	6,15,389 Nos.
3.	Solar Lantern	13,03,275 Nos.
4.	Solar Homelight	35,371 Nos.
5.	Solar Street Lights	1680 Nos.
6.	Solar Cookers	500 Nos.
7.	Solar Hot Water	127800 LPD
8.	Wind Mills	269 Nos.
9	Biomass gasifier	72 Nos. / (11.21 MW)
10	Institutional Biogas Plants	4 Nos.
11	BADP Street Lights	1270 Nos.
12	Solar Water Pumps (2HP)	2187 Nos. (3.94 MW)
13	Solar Water Pumps (3HP)	585 Nos. (1.755 MW)
14	Off-grid Solar Rooftop Power Plant	8.106 (MW)/ 5095 Nos.
15	Operational Mini Grids	146 Nos. / (4MW)

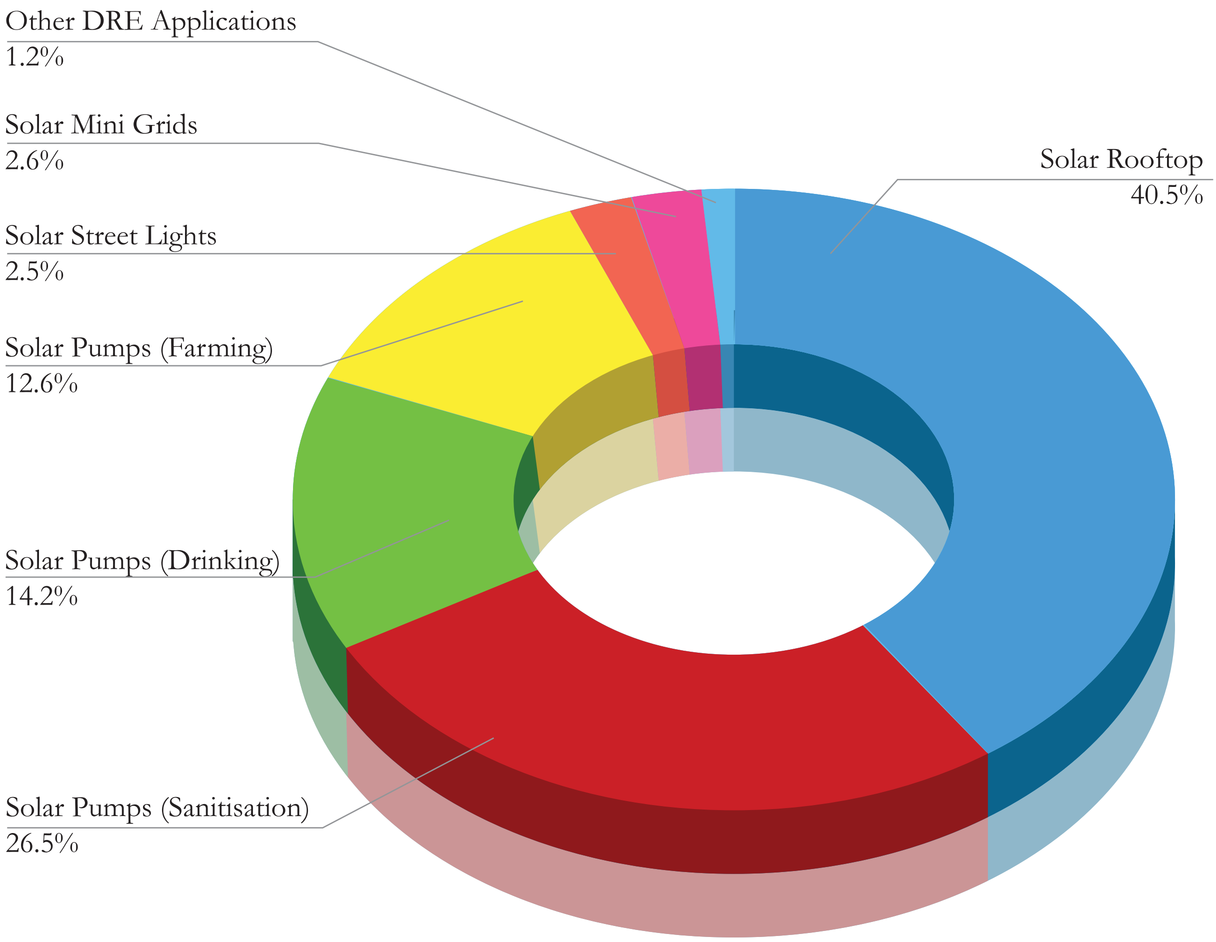
2.1 Potential of DRE in Bihar

DRE has a potential of 3948 MW in the State

As per our analysis, there are more than 200 schemes/programs[9] running across 43 departments in Bihar out of which 88 schemes/programmes have the scope of infusion of the DRE. These schemes are largely related to irrigation pumps, street lights, solar lightning, agro electrification, agro value chain, health value chain, education, sanitation, drinking water supply, electric charging stations etc. where a larger scope of DRE inclusion has been explored. The estimated potential shown here has been calculated as per the scope of work defined by the respective departments and further inclusion of the DRE the departments have either done or can do in future.

The DRE potential in terms of applications/solutions has been shown below in Figure 2:

DRE Potential by Applications **Figure: 2**



Source: CEED Analysis

Figure 3: Department wise DRE potential in Bihar	
STRONG	**MODERATE**
Rural Development Department	Department of Industries
Rural Works Department	Building Construction Department
Public Health and Engineering Department	Environment, Forest & Climate Change Department
Department of Agriculture	Panchayati Raj Department
Health Department	Animal and Fisheries Resource Department
Energy Department	Water Resource Department
Education Department	Minority Welfare Department
Social Welfare Department	Disaster Management Department
Transport Department	Department of Information Technology
Urban Development and Housing Department	Prohibition, Excise & Registration Department
Minor Water Resource Department	Vigilance Department
Co-operative Department	Commercial Taxes Department
Road Construction Department	General Administration Department
Art, Culture and Youth Department	Parliamentary Affairs department
	Planning & Development Department
	Science and Technology Department
	Finance Department
	SC & ST Welfare Department
	Home Department
	Tourism Department
	Backward Classes and Extremely Backward Classes Welfare
	Mines and Geology Department
	Department of Law
	Revenue & Land Reforms Department
	Information and Public Relations Department
	Food and Consumer Protection Department
	Sugar Industries Department

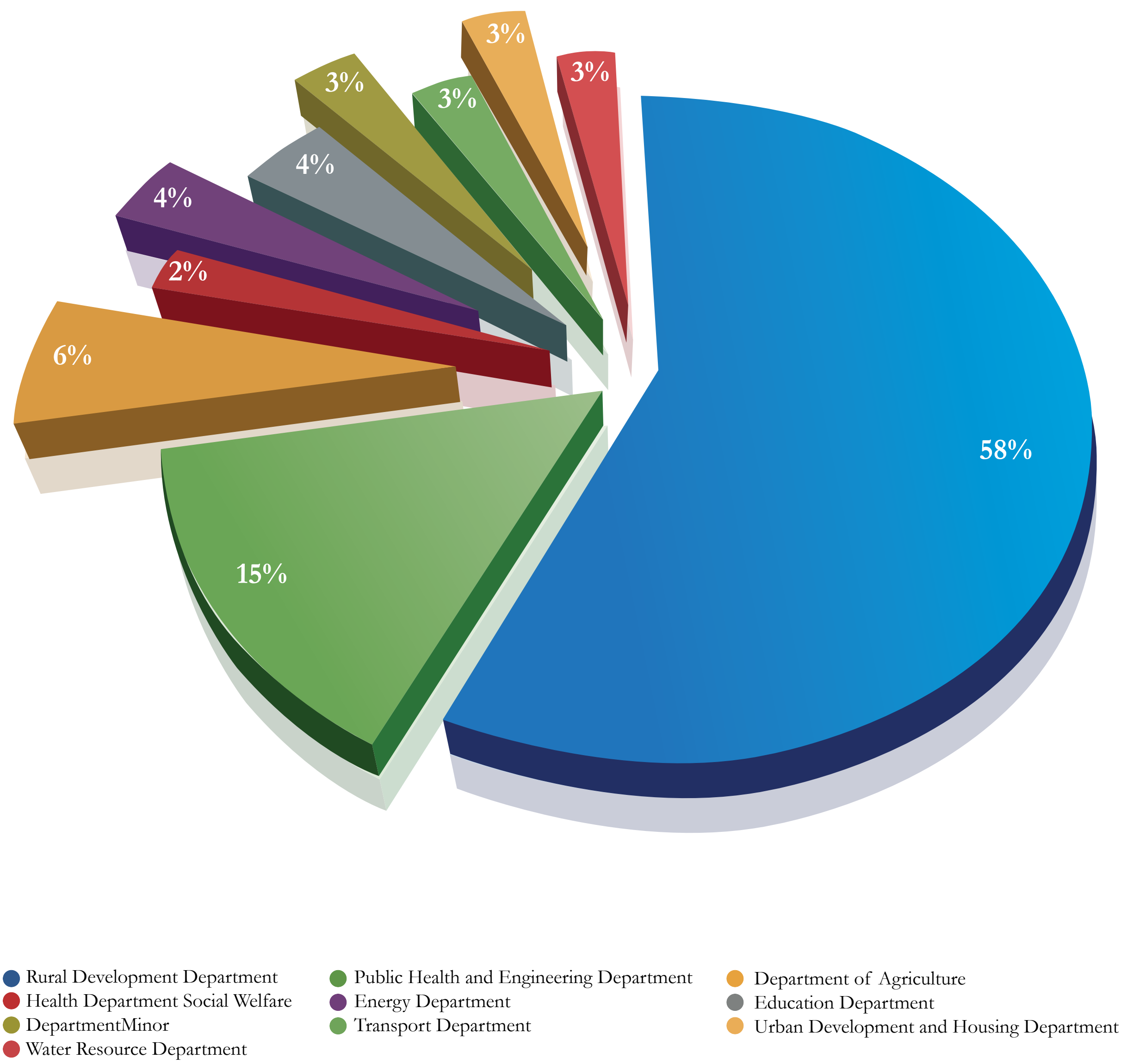
Source: CEED Analysis

2.3 Top 10 Departments play important role in meeting DRE potential

Top 10 Government Departments can meet 95% of the DRE potential

Although many departments have a wider scope of DRE inclusion, but chief among them are Rural Development, Agriculture, Health, Energy, Public Health and Engineering Department, Urban Development, etc. These departments are very important in terms of meeting sustainable development goals and ensuring faster economic growth in the state. The graph portrayed here mentions the Top 10 departments that can contribute in the majority (i.e around 95%) of the DRE potential in the state (Figure 4).

Top 10 Departments contributing to overall DRE Potential **Figure 4**



Source: CEED Analysis

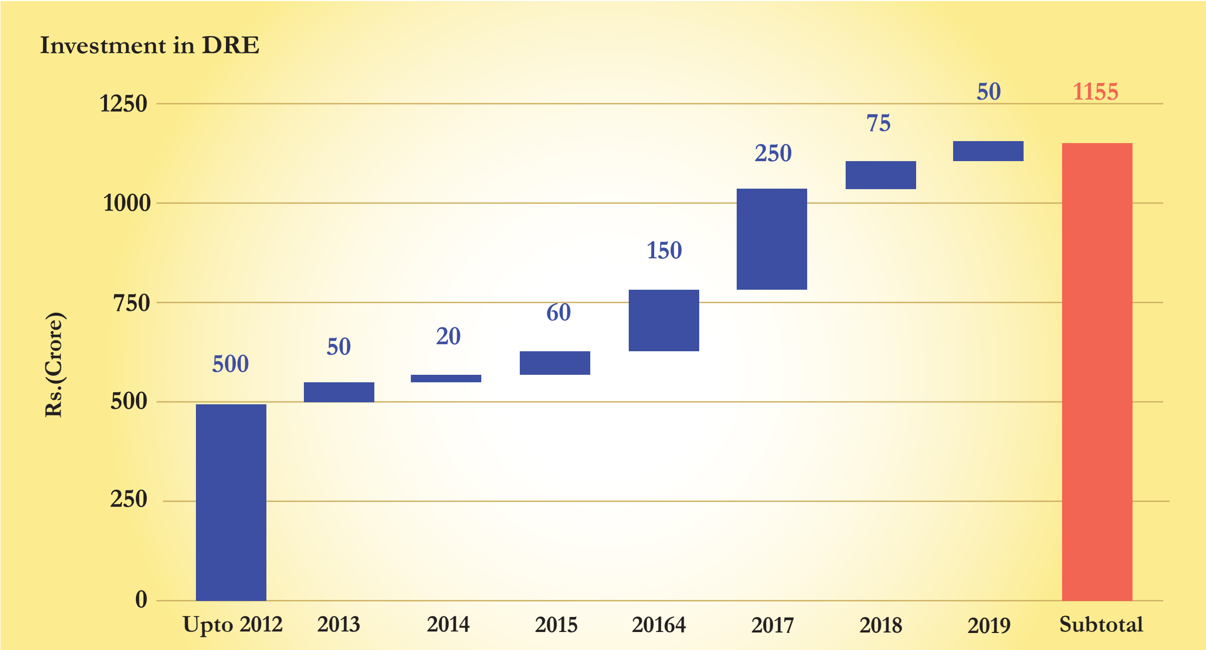
2.4 Potential Major Schemes across departments that have larger scope/infusion of DRE [10]

Scheme	Scope / Solution
Lohia Swachh Bihar Abhiyan	**Scope:** To provide toilet facility to 1.4 crore families to make Bihar open defecation free **Solution:** 14 lakh solar powered community solar pumps for adopting a community based holistic sanitation
Pradhan Mantri Awas Yojna	**Scope:** Around 32 lakh households have been targeted to provide housing facility **Solution:** Stand alone solar rooftop power plant to electrify the household and fulfilling the basic needs of the family
Har Ghar Nal Ka Jal (Mukhyamantri Gramin Peyjal Nishchay Yojana)	**Scope:** To provide drinking water facilities in 58,612 rural wards of4,291 Gram Panchayats (out of a total 1,14, 691 rural wards in 8386 Gram Panchayats) **Solution:** Solar water pumps at rural wards for providing safe drinking water
Jal Jeevan Hariyali Abhiyaan	**Scope:** Around 45000 raditional water resources to be developed for irrigation **Solution:** Solar water pumps for 4,50,000 farmers for powering the irrigation
Mukhyamantri Gramin Peyjal (Gunvatta Prabhavitkshetra) Nishchay Yojana	**Scope:** To provide potable water facilities in 3814 Flouride affected rural wards; 5,085 Arsenic affected rural wards; 21,598 Iron affected wards **Solution:**Solar water pumps at rural wards for providing safe drinking water
Agriculture Mechanisation	**Scope:** Irrigation through Solar Pumps for less use of diesel pumps **Solution:** Providing 50,000 mobile Solar Pumps, maize sheller, paddy thrasher for irrigation and post harvesting activities
Mukhya Mantri Samagra Vidyalaya Vikas Yojna	**Scope:** To develop 72663 Primary, Secondary & Intermediate Educational Institutes **Solution:** Strengthening of educational institutes with Solar Rooftop system
Pradhan Mantri Gram Sadak Yojana (PMGSY)	Scope: Provision to make 59,374 KM of safe roads safe for transport Solution: 6 lakh solar street lights can be installed to make roads safer
Anganwadi Construction Scheme	**Scope:** Construction of 114718 Anganwadi Centres for promoting child nutrition services **Solution:** Installation of Solar Rooftops at 114718 institutions

2.5 Current Status of Investment in DRE segment

Bihar government has invested around 1155 Cr [11] for boosting the DRE segment so far (see Figure 5). The investment pattern suggests that biomass was largely promoted before 2012 and then after the investment has shifted entirely towards the solar models.

Investment in the DRE sector so far **Figure 5**

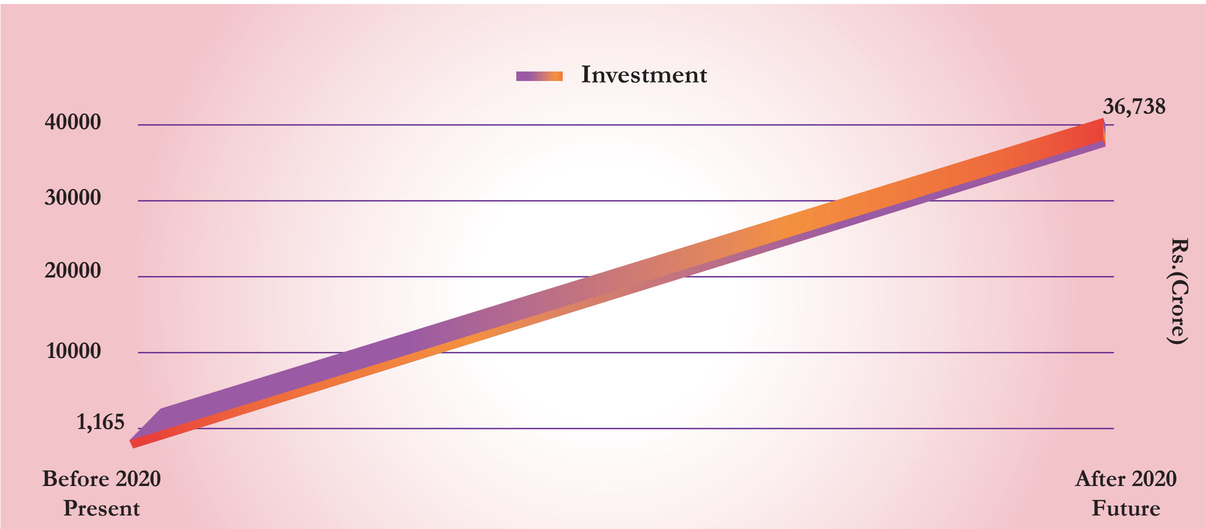


Source: Economic Survey of Bihar (2017, 2018, 2019)

2.6 Potential investment in DRE for statewide deployment

The DRE segment has an investment potential in tune of Rs. 36,738 Crore in the state (Figure 6). The investment has been calculated here based on the MNRE benchmark cost for the off-grid applications for 2020-21. [12]

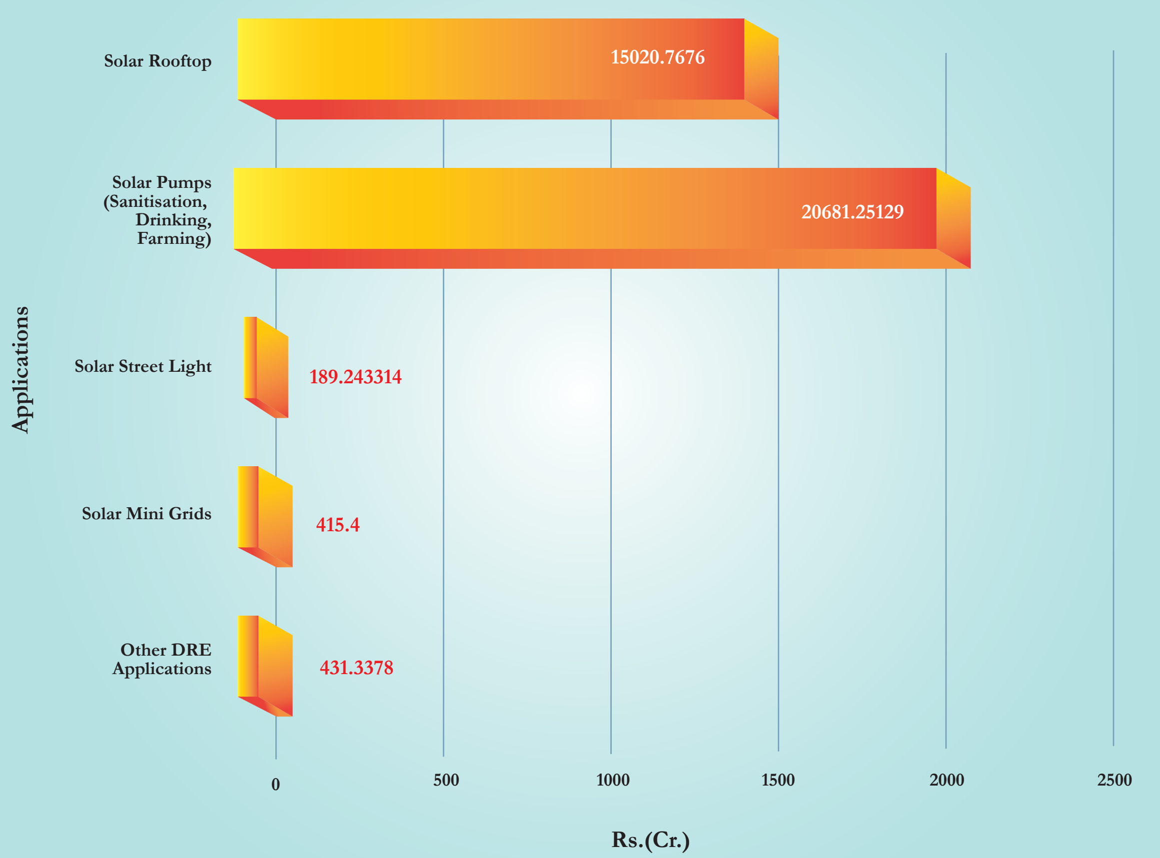
Potential Investment for statewide deployment of DRE **Figure 6**



Source: CEED Analysis

Some of important DRE applications such as Solar Pumps, Solar Street Lights, Mini Grids, Stand alone Solar Rooftops are the key areas where the largest potential investment exists (as shown in Figure 7).

Top 5 Leading Investment Creators in DRE **Figure 7**



Source : CEED Analysis

3. DRE as a Catalyst for Climate Change Mitigation

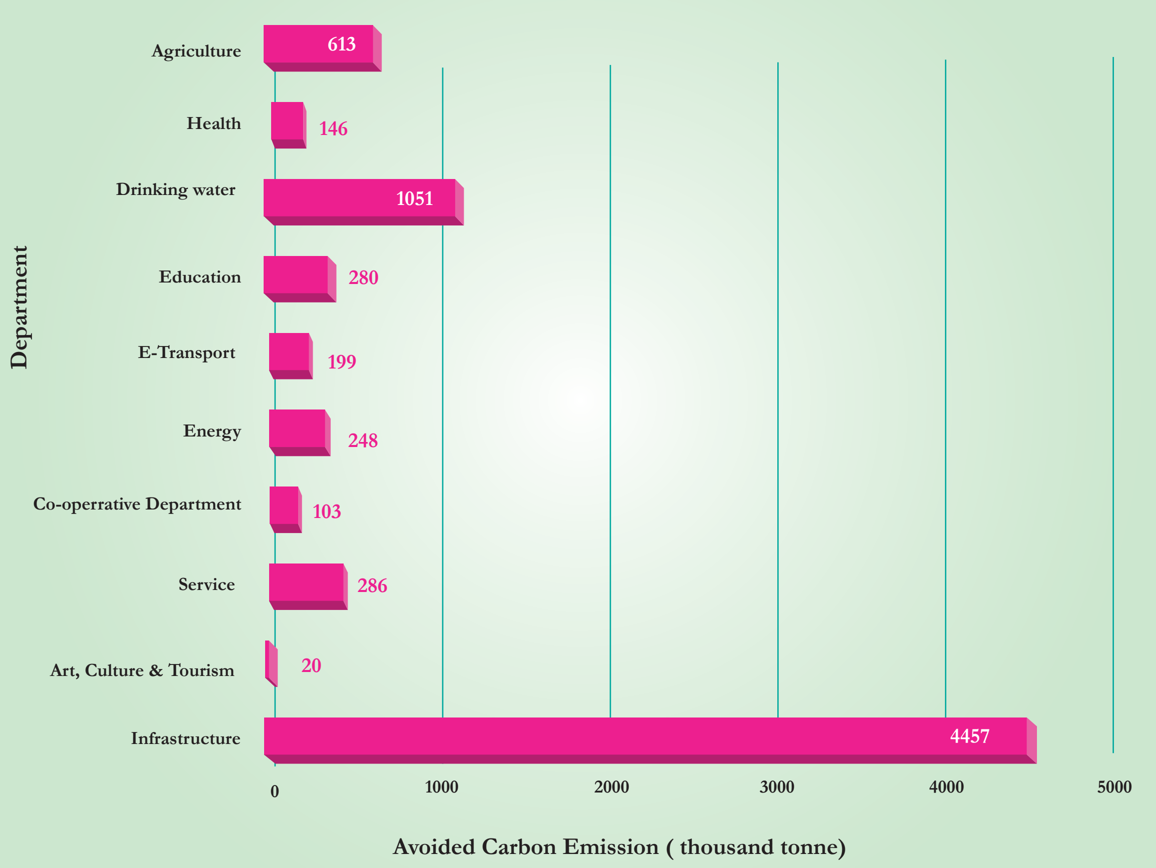
DRE can contribute in avoiding 73,10, 636 tons of CO_2 emissions

Bihar is one of the climate fragile states of India, where global warming and climate change impacts have resulted in distress migration, socio-economic losses and vicious cycle of poverty. The DRE brings in a compelling argument in favour of a cleaner energy paradigm in the time of climate change impacts that have severely impacted farm and non-farm activities with regular occurrence of drought, floods and other natural calamities affecting millions of lives in Bihar. DRE can significantly contribute in meeting the SDGs related to reducing poverty, energy security and bringing in environmental co-benefits.

The reduction in energy-related CO_2 emissions is at the heart of the sustainable energy transition. CEED's analysis indicates that more uptake of RE and energy efficiency measures can avoid over 73,10,636 tons of CO_2 emissions which is equivalent to 1,447,350 passenger vehicle driven in a year covering 16.6 Crore miles a year.[13]

The critical sectors [14] responsible for reduction of carbon emission are as shown below in Figure 8:

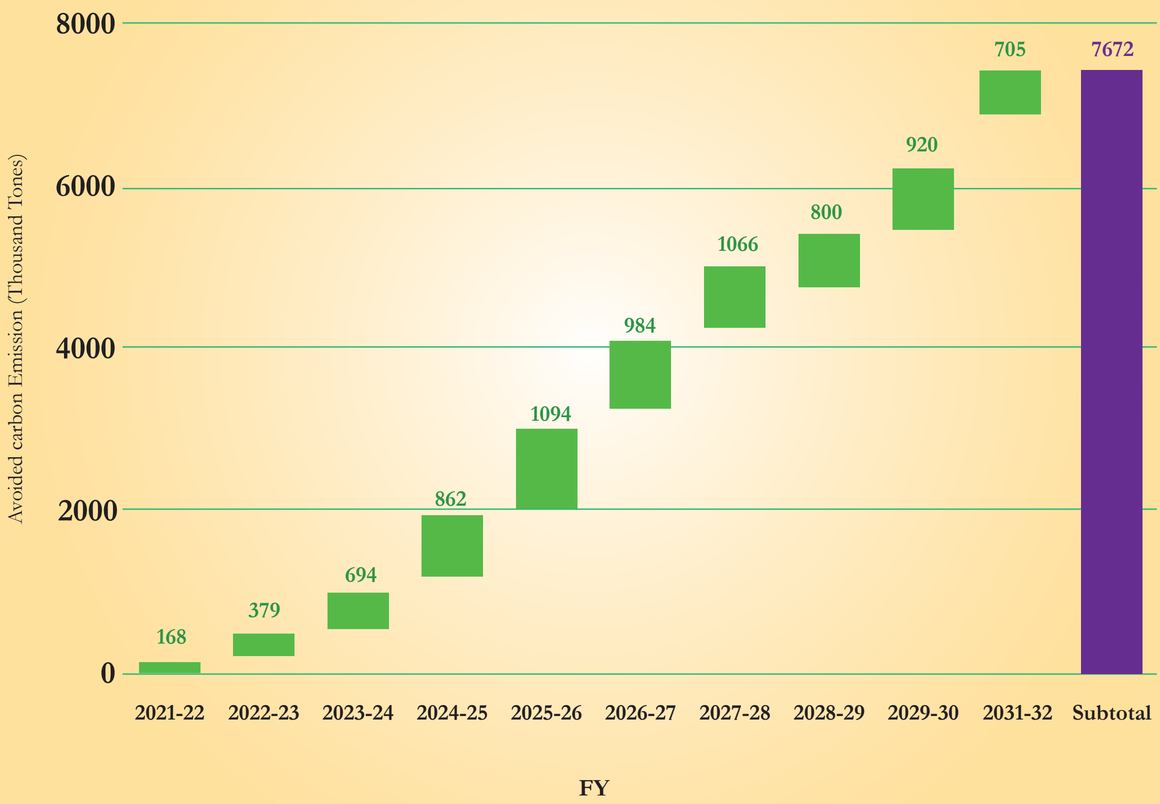
Avoided Carbon Emissions in the critical sectors **Figure 8**



Source : CEED Analysis

The forecast for the avoided carbon emission is indicated below (in Figure 9) for the period between FY 2021-32.

Forcast for Avoided Carbon Emission **Figure 9**



Source : CEED Analysis

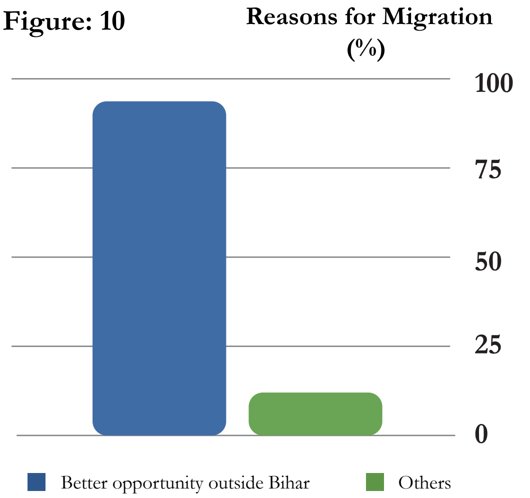
4. Role of DRE in Creation of New Job Opportunities

The DRE can create 1,71,210 new job opportunities in the state

4.1 Key findings of the Primary Survey of returned migrant workers

Due to the effects of COVID pandemic, over 1.7 million workers returned back to Bihar.[15] An estimate by the International Labour Organisation (ILO) [16] suggests that about 400 million workers in India, who are primarily engaged in the informal economy, are at greater risk of falling deeper into poverty during the COVID-19 crisis. Bihar is no exception to this. With over 34% of the state's population living below the poverty line [17], Bihar is a poor state and it contributes almost 15% in total migrant labours in the country. [18]

Figure: 10



Source: CEED Analysis

For getting a broader idea of current status of migration and what are the views of migrant workers on job and livelihood opportunities, CEED conducted a primary survey of around 380 returned migrant workers representing different geographies of the state. The survey findings validate that the lack of job opportunities within the state has forced a large number of people to move outside in search of livelihood opportunities. Around 90 percent of returned workers responded that better opportunities exist in other states which is a key reason for their migration (Figure 10).

An indicative profiling of migrant workers also emerged through the survey findings, which tells that the majority of the migrant workers were indulged in construction, petty businesses and other sectors as means of livelihood option (as mentioned in Figure 11). Asked about their preferred choice of livelihood option, their responses suggest largely their interests towards the same occupations they used to do outside the state for earning livelihood (Figure 12). The skill profile indicatesthat the semi-skilled or unskilled workers largely constitute the workforce.

Profile of Migrant Workers

Source: CEED Analysis

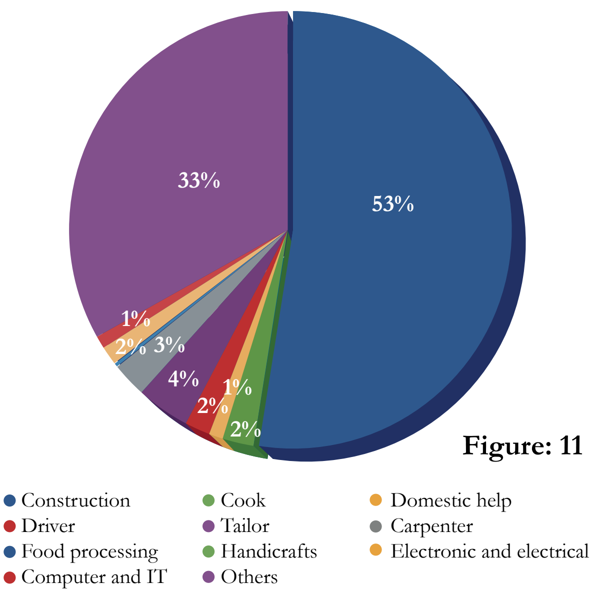


Figure: 11

Livelihood Options indicated by Migrant Workers

Source: CEED Analysis

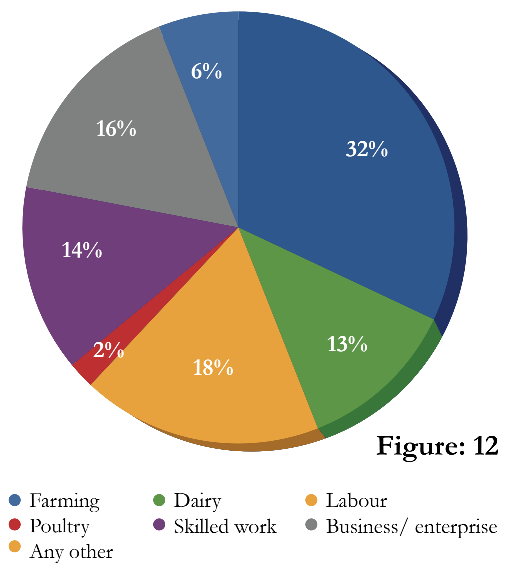


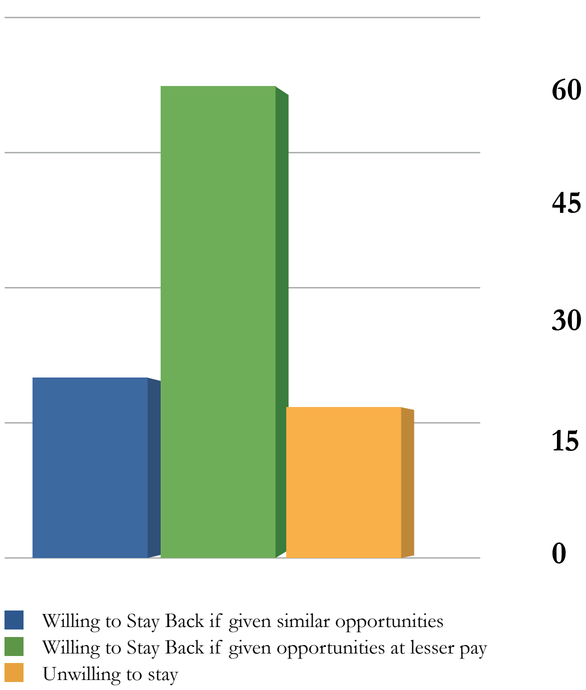
Figure: 12

In response to the question, if they get better job prospects locally will they stay in Bihar, overwhelming 80 percent returned migrant workers responded positively with indicating that they are keen to stay and contribute to overall growth of the state (see Figure 13). Overall, the findings of the survey suggest that given the right opportunity with skill development and right wages, the outer migration can decrease to a considerable extent.

Although the migrant workers have started going back with ease of several episodes of lockdowns in recent months, still a large number of migrant workers have stayed back and they are looking for opportunities for working within the state. In this connection, skill development is critical for reversing the tide of outer migration.

There are multiple programs instituted for skill development by the government of India such as Pradhan Mantri Kaushal Vikas Yojana (PMKVY) to encourage the youths to take up training programs Deendayal Upadhayaya Grameen Kaushalya Yojayan (DDU-GKY) etc. for placement linked skill development for low-income rural youths. Additionally, the state government already has livelihood missions like 'Jeevika' for serving some of these purposes.

Figure: 13 **Responses on staying back, if given jobs locally (%)**



Source: CEED Analysis

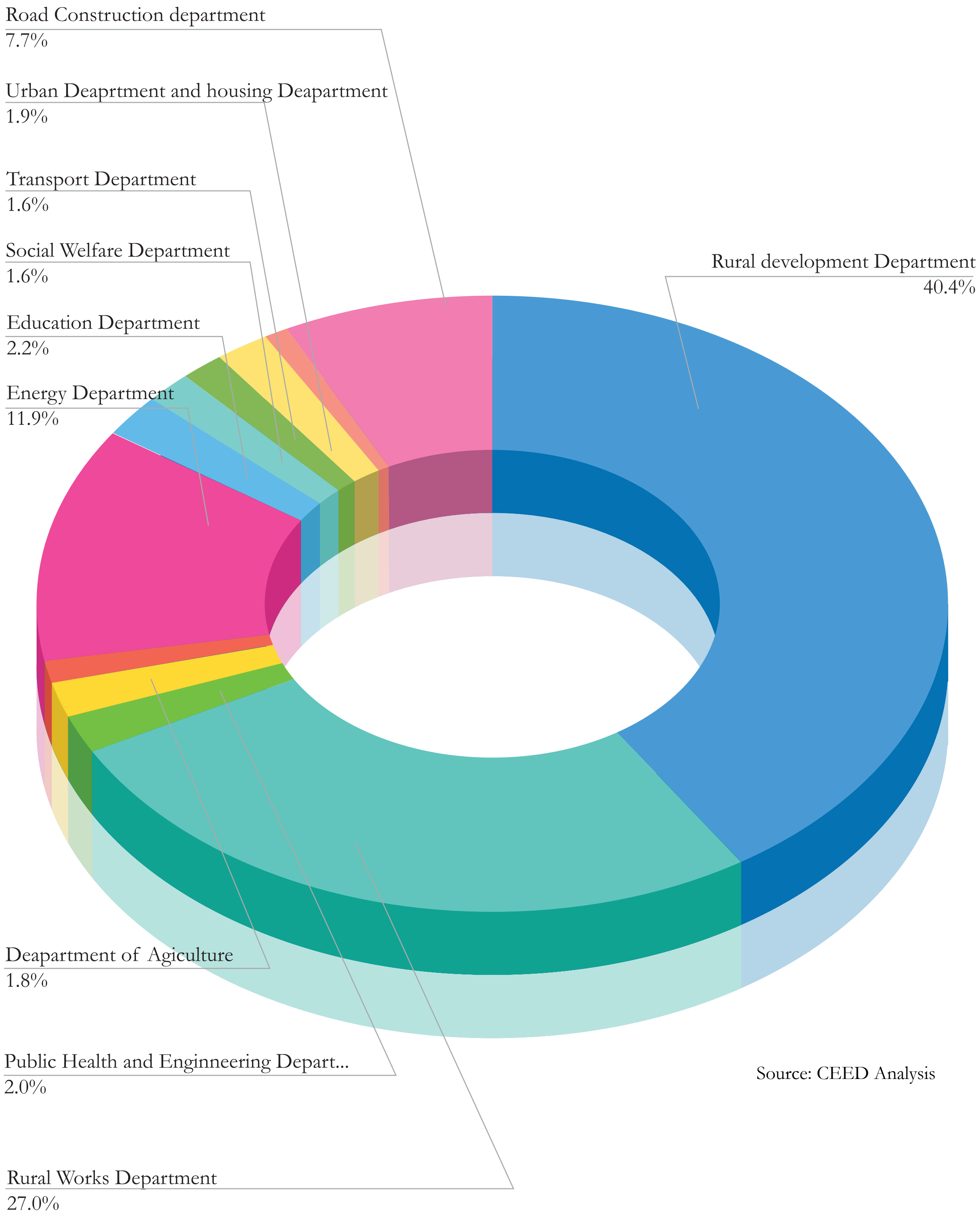
In the recently concluded election, creating new jobs and finding local employment opportunities for the returned migrant workers became one of the major poll planks, thus the political consensus on employment generation locally can also be interlinked with the overall narrative of the DRE as one of the promising sector for ensuring a new set of jobs. This will give much needed respite to the state government, which can fine-tune existing schemes and create new programs for absorbing these workers in newer areas like DRE. Bihar Government should work in a Mission mode to create a roadmap for absorbing migrant workers as per the skills set they bring in and ensure a sustainable livelihood option for them. This step can check outer migration, manage the crisis emerging through returned workers and further build the momentum of DRE growth in the state.

4.2 New Job Opportunities through DRE

The capacity addition of 3948 MW in the DRE segment will help in creation of 1,71,210 new jobs in the state. The estimated job creation here has been derived in the lights of the methods adopted by other organisations on calculating the jobs in the DRE segment. A study by Power for All titled "Powering Jobs Census 2019: The Energy Access Workforce" estimated 45.6 jobs per 1000 applications for Pico Solar Appliance and Solar Home lighting System up to 200 W, Mini Grids contribute 197.1 Jobs/MW and Solar Pumps contribute 29.9 Jobs per 1000 such applications[19]. A couple of studies by the Council on Energy, Environment and Water (CEEW) and Natural Resource Defence Council (NRDC) and IRENA concluded that in India roughly 25 job-years are created for every MW of rooftop solar systems developed and installed[20] [21]. CEED's analysis is based on these calculations in reaching an estimated figure on jobs.

As indicated earlier that some major departments have larger scope of DRE, a break up of new job opportunities across 10 government departments are mentioned in Figure 14:

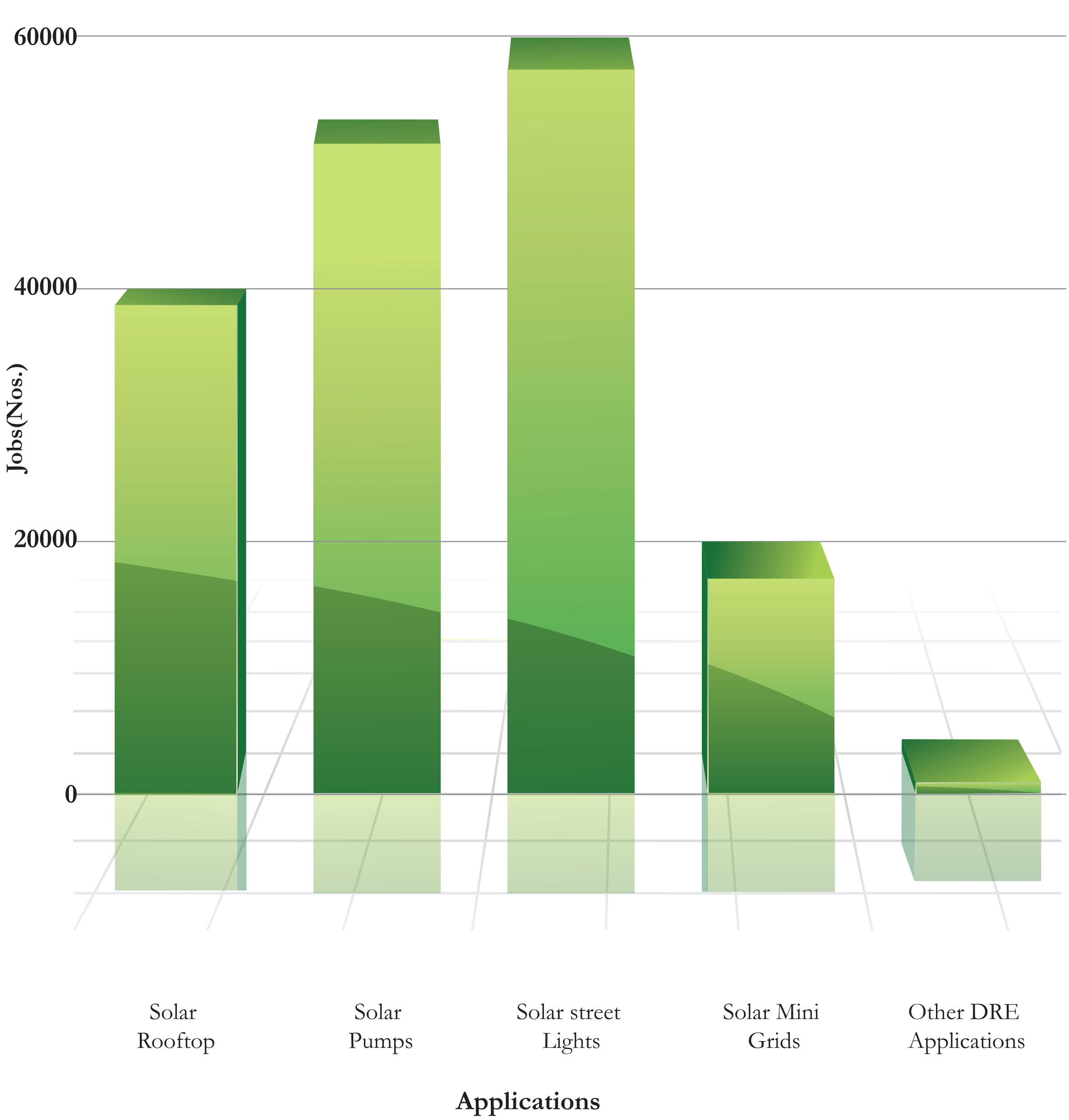
Role of Top 10 Departments for New job Opportunities **Figure: 14**



Source: CEED Analysis

Our analysis suggests that unlike grid connected projects the number of jobs in the DRE segment is dependent on the capacity and the number of applications [22]. The below mentioned Figure 15 suggests that the solar street light presents higher opportunities followed by solar pumps and solar rooftop.

New Job Opportunities based on applications **Figure: 15**



Source: CEED Analysis

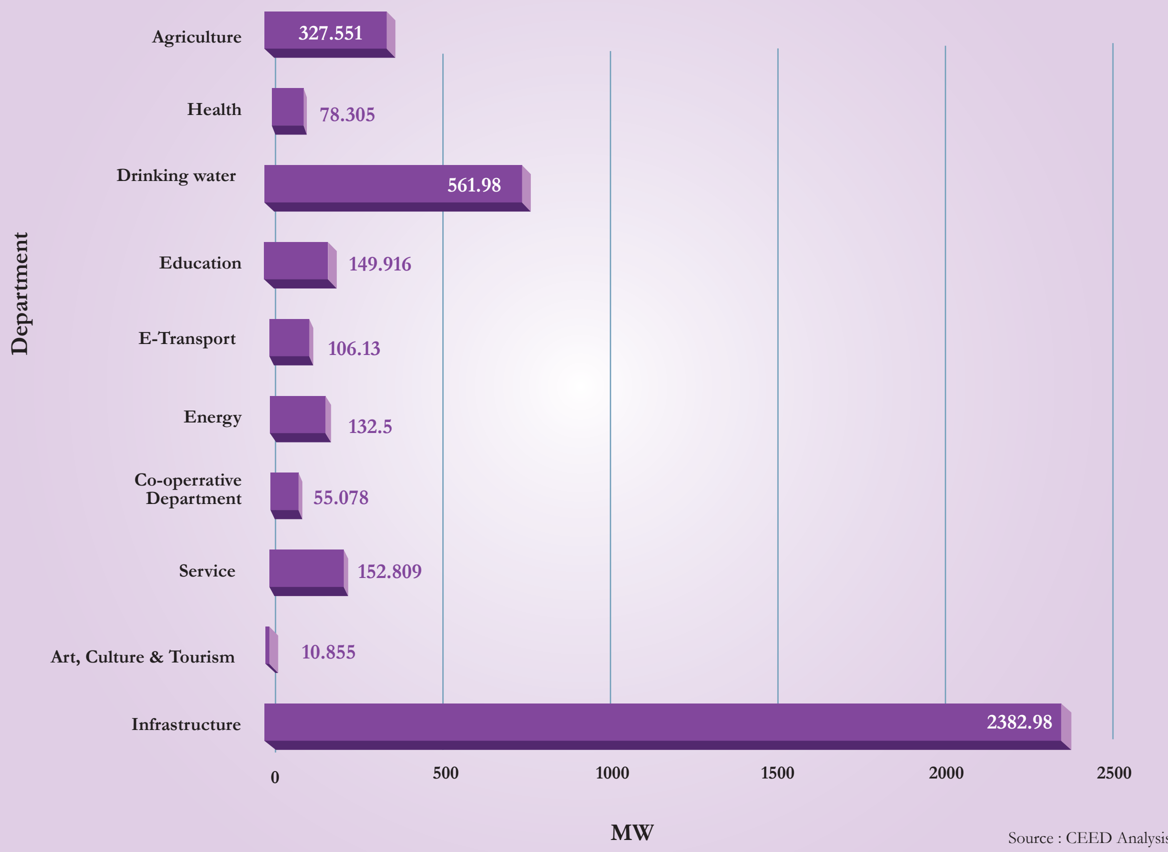
5.Roadmap for DRE Deployment in Bihar

Renewable Energy has been a priority area for the Bihar government given its proactive approach in taking several measures and formulating a state policy for the same in 2017. Bihar is one of the few states that presented a separate Green Budget of around Rs. 3000 Cr in the year 2020. With the same new government in place after the state assembly election in 2020, it can be assumed that similar kinds of measures and commitments can continue in near future.

Some of the sectors such as infrastructure, agriculture, health, education etc play a crucial role in DRE deployment as shown in Figure 16.

Top 10 critical sectors for the DRE deployment:

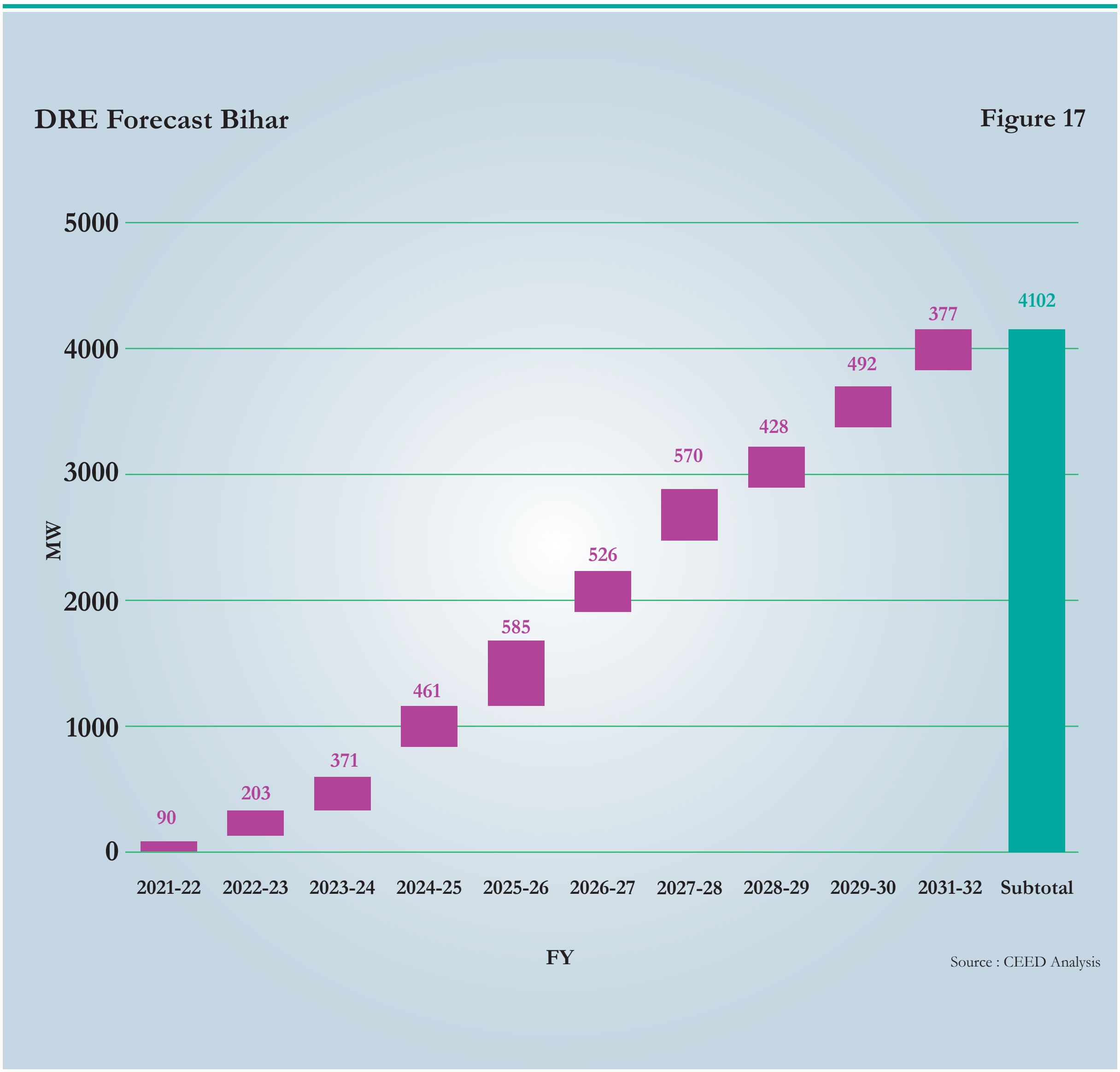
Critical Sectors for DRE Deployment **Figure 16**



Source : CEED Analysis

Forecast of the DRE deployment

The forecast for the deployment of DRE with annual capacity addition till FY 2031-32 has been shown in Figure 17:



6. Enabling Framework for Statewide Deployment of DRE

Bihar faces several daunting tasks ahead in terms of meeting rising energy demands and renewable purchase obligations targets with tilting its energy basket in favour of renewables for becoming one of the leading states in adopting cleaner energy in India. What is needed here is creation of an ecosystem and an enabling framework that can deliver implementation support, create knowledge, engage with multiple stakeholders and most importantly bring in the investment and capital from the public and private sectors.

6.1 Creation of a DRE Mission

Considering the lesser installed capacity achieved so far, there is an urgent need to create a 'DRE Mission' which can function with a provision of a Mission Director (of senior IAS officer rank or a specialist cadre officer) in place. A separate mission is needed because the BREDA and the Energy Department only cannot achieve the overall target of the DRE considering the prominent roles played by the various other departments. The mission director can be placed in the Planning Department or any of the departments for overall monitoring of the DRE installation, coordination and quality assurance related work and assisted by designated nodal officers in each of inter aligned departments. The resources of top ten departments should be channelised to the DRE Mission with adequate provision by the Finance and Planning department.

The DRE mission can be given the task of streamline all functions and mandates on the DRE with creating an ecosystem and an enabling environment to properly flourish the sector. Convergence is the key here since the cohesive and coordinated roles between aligned departments can bring in much needed learnings and knowledge and further help out in all round development of the sector with bringing in immense employment opportunities and environmental co-benefits.

6.2 Access to Finance and Enabling Ecosystem

Access to affordable finance is necessary to enable and scale the adoption of DRE solutions and in this connection public finance plays a crucial role.[23] Increasing government commitments through budget allocations and incentive based programmes can be useful in integrating sustainable energy interventions into the aim and objectives of every aligned departments. The soft funding sources particularly grants and subsidies play an important role in bridging the energy access gap. Moreover, substantial increases are needed in public funding to leverage commercial investment as well.

There are several schemes from the Government of India that can enhance the uptake of the DRE. For instance, *Scale Up of Access to Clean Energy Scheme* by MNRE that focuses on creating technology awareness and availability, establishing market linkages; while *Pradhan Mantri Kisan Urja Suraksha Evam Utthan Mahabhiyan* (PM-KUSUM) provides individual farmers subsidy support to install standalone solar agriculture pumps. Moreover, some prominent state government plan and schemes, e.g. **'Third Agriculture Roadmap 2017-22' (which has planned allocation of Rs. 1.54 lakh crore) and 'Bringing Green Revolution to Eastern India (2010-11)' and 'Jal Jeewan Hariyali Mission' and 'Saat Nishchay-2 (Second phase of Seven Resolutions of Bihar government for development works) can be instrumental in providing support through public finance rout.**

Apart from this, private investment and public, private, partnership (PPP) play an important role in building an ecosystem where all parties concerned make joint effort for expanding the market base and deployment of DRE applications. There is a conclusive need to accelerate private sector participation in the sector. All the scheduled banks and financial institutions should be motivated to at least disburse 10 percent of their overall loan portfolio to DRE projects. Further, the disbursement of loans for farmers shall be provisioned without collateral and 'Pay as You Go Model' may be adopted.

6.3 Access to Innovative Technology and Capacity Building measures

To make Bihar self-reliant in terms of manufacturing of solar equipments an in-house domestic solar module manufacturing industry and other ancillary facilities should be developed with proper incentive mechanisms. In this connection, there must be a provision for creating a 'Solar Park' along the lines of 'Special Economic Zones' in a specific location of the state, preferably near Patna or any other major commercial location.

For imparting tech know-how and access to innovative technologies district based training centres and local service outlets on DRE technologies should be developed which can team up with industry for catalysing clean energy related enterprises and activities in the state.

A comprehensive approach encompassing awareness generation to publics and capacity building measures for various stakeholders located at various levels e.g. developers, demonstrators and local entrepreneurs on new schemes, programs and access to financing should be done at regular level. Building the capacity of financiers at various levels to understand the specific needs of key stakeholders and ecosystem actors should be given priority.

6.4 Need of reviewing State Renewable Energy Policy-2017

Despite having a supportive State RE policy (2017) in place, the past experiences suggest that various challenges and bottlenecks have occurred while moving on to the path of DRE deployment, and in this connection quashing of the Mini grid regulation was one among them. The mini grid regulation was framed to bring all the consumers under a single tariff umbrella as well as forging a sense of security for the RE developers, but due to the resistance from the Distribution Companies (DISCOMs) the whole regulation was nullified and it put a huge setback on the investors and the developers part.[24]

The policy also has a provision for solar concentrators technology but no formidable initiative was taken in this front as well. In spite of having a provision for deployment of 10,000 solar pumps, formidable progress in this direction has been very slow. Similarly, incentives for new projects for new MSMEs was a good measure but it missed out the infusion of those old MSMEs who were willing to opt for renewables. The deployment of DRE also took a hit due to inconsistent subsidies over the past years and also due to the decrease of subsidy to a considerable extent. As a result, no new biomass projects were taken up. The RE development fund mentioned in the policy has remained inactive from the beginning. Similarly, mid term review and impact assessment of the policy has remained to be on the paper only.

In such a backdrop, it is imperative that the policy and regulation in support of the DRE initiative should work in tandem, where the subsidy being a key driving factor shall be given due importance and be clearly defined. The provision of revolving funds for ensuring timely payments to the developers will also help in increasing the trust and interest of the developers for boosting the investment portfolio.

6.5 Political Consensus on the state-wide DRE Deployment in Bihar

Recently concluded Bihar State assembly election has seen a strong political consensus emerge across all party lines on the DRE solutions for strengthening the state economy thanks to a public campaign led by the CEED and its partner Civil Society Organisations. The leading political parties such as Janata Dal United (JDU), Bharatiya Janata Party (BJP), Rastriya Janata Dal (RJD), Indian National Congress, Jana Adhikar Party, etc. gave prominent focus to the DRE models in their election manifestos. Some of the promises made by these parties are encouraging, for instance Janata Dal United pledged for solar street lights in every village and interlinked DRE applications in to the 'Saat Nischay-2' initiatives; while BJP promised for irrigation support to every farm and 1 lakh solar pumps with subsidy to the farmers. Similarly, RJD took resolution of having solar feeders in agro sector and wider usage of solar application in public health institutions; whereas Congress took a holistic approach on renewable energy for strengthening the economy. Now the JDU and BJP are back in power again while RJD and Congress sit in the opposition, however the political consensus across wider political spectrum has rightly positioned the DRE for initiating a new path of sustainable future. This fills the earlier lacuna of not having a wide-ranging consensus on cleaner energy options, and now it can motivate all lawmakers cutting across party lines to further move on to a sustainable development roadmap with a clear vision and intent.

7. The Key Recommendations and Conclusion

Key Recommendations

- Institutionalisation of DRE Mission is key to inter-departmental convergence (e.g. departments of energy, agriculture, water resources, industries, rural development etc.) for streamlining of policy formulation and monitoring and effective implementation of programs at the ground level.

- Creation of an enabling framework for more inclusion of DRE elements in all programs and schemes will bring in a much needed ecosystem that will provide easy financing and accessibility of technologies to the newer entrepreneurs and early adopters.

- A special task force should be created for managing the better profiling of skills of returned migrant workers and correlate with skill building programs and giving special focus on merging with the DRE segment. For harnessing a gifted labor force requires a clear vision and adequate measures by the government, industry, and key partners. The skill development related ecosystem should also tie-up with the industry sector for better management of the human capital.

- Need to have an integrated approach to data, technology and finance so that concrete change can be brought into policy and implementation terms at various levels.

- Create and nurture in-house domestic solar module manufacturing industry and other ancillary facilities with proper incentives to support the increasing DRE demand. Also, various measures should be taken to support local training centres teaming up with industry, especially on a regional basis, to extend clean energy related enterprises and occupations across Bihar.

- Issue sensitisation and awareness generation with all stakeholders and people at large for wider adoption and promotion of DRE and their capacity building on proper tech know-how with context-specific deployment strategies should be promoted.

The narrative on the DRE has over the years moved beyond the idea of energy access to transforming people's lives and strengthening the state economy, which is more relevant in the post-COVID scenario. As the findings of this study show, Bihar has immense scope of DRE expansion and it is poised to embark on a new energy paradigm that will give more impetus to the cleaner and greener energy solutions with creating new sets of jobs locally. The need of the hour is to augment the renewable revolution at the countryside with the help of private investment, pathbreaking innovations and technology demonstration along with a conducive regulatory framework that will enable Bihar to offset the impacts unleashed by the COVID-19 and make her a frontline state in the DRE deployment.

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