



DRE for Powering Health Infrastructure in Bihar

CEED 2021



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ABBREVIATIONS

ANM	Auxillary Nurse Midwife
APHC	Additional Primary Health Centres
ASHA	Accrediated Social Health Activist
AWW	Anganwadi Worker
BHM	Block Health Manager
CHC	Community Health Centre
COVID	Corona Virus Disease
DH	District Hospitals
DHM	District Health Mission
DLHS	District level Health Society
DRE	Decentralized Renewable Energy
GDP	Gross Domestic Product
HDI	Human Development Index
HEOC	Health Emergency Operation Centre
HWC	Health and Wellness Centers
ICU	Intensive Care Unit
ILR	Ice- Lined Refrigerator
IMR	Infant Mortality Rate
IPHS	Indian Public Health Standards
KVA	Kilovolt Ampere
Kwh	Kilowattt hour
MCH	Mother and Child Health
MMU	Mobile Medical Unit
MNRE	Ministry of New and Renewable Energy
MO	Medical officer
MOHFW	Ministry Of Health And Family Welfare
MW	Mega Watt
NCCMIS	National Cold Chain Management Information System
NFHS	National Family Health Survey
NHM	National Health Mission
NRHM	National Rural Health Mission
NSSO	National Sample Survey Organisation
NUHM	National Urban Health Mission
PHC	Primary Health Centre
PV	Photo Voltaics
RCH	Reproductive and Child Health
RH	Referral Hospital
RHS	Rural Health Statistics
SDG	Sustainable Development Goal
SDH	Sub- District Hospitals
SHC	Sub Health Centre
SRS	Sample Registration System
UDHR	Universal Declaration of Human Rights
UN	United Nations
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organization

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Executive Summary

Healthcare has been one of the important elements in the governance system in India since it draws from the principle of welfare state for serving the people. Health has been given prominence in the Sustainable Development Goal (SDG) 3 of the United Nations as well, which ensures healthy lives and well being to every person. Access to energy is equally important like accessibility to health services for myriad reasons, similarly the SDG 7 mandates the access to reliable, affordable and sustainable energy for improving living standards. From a healthcare perspective, energy is a critical parameter for ensuring universal health care coverage and overall human development, thus 'Health and Energy Integration' is one of promising areas for meeting twin objectives of ensuring energy security to the health institutions and simultaneously enhancing accessibility of health services to the people.



The pandemic of Covid-19 has impacted the economy and state affairs in unprecedented ways, and health and hygiene have taken priority over everything which in turn has over-burdened the already poor health infrastructure in an unimaginable way. The health sector of Bihar has been facing severe human resource crunch, lesser public spending and intermittent electricity supply impacting the delivery of services. Analysing the healthcare sector on the pillars of accessibility, availability, and affordability the state is facing huge gaps and challenges in the area of public health infrastructure. In such a grim scenario, the Decentralised Renewable Energy (DRE) enabled solutions have come at fore like a silver lining for resolving the energy crisis faced by the health infrastructure segment.

The study of CEED indicates that DRE has a potential of 266 MW in the health sector and it can create 13,173 new job opportunities. Moreover, this study also indicates that DRE has an investment potential of Rs 2470 Crores in the state health sector. In the distressing times of climate change impacts, one of the best clean energy options available before us DRE can significantly contribute in avoiding 11,20,414 tons of CO2 emissions with bringing several environmental co-benefits.

Since Bihar has a decentralised health infrastructure in place, so DRE suits with its customisation and flexible attributes and is capable of reaching people at the last mile. In rural hospitals DRE applications can provide an array of services during medical emergencies through solar-based cold storage, vaccine refrigerator, baby warmer and portable health care kits, etc. This will have a huge positive impact in improving major health indicators. Thus, there is a compelling argument in favour of DRE supporting the rural healthcare sector and delivering health goals in the most effective and sustainable manner.

For transforming the healthcare scene in the rural areas, a series of strategic steps must be taken to put equal emphasis on appropriate technologies along with human and financial resources for a resilient health system. For alleviating the pandemic of COVID-19, one of major steps of the cold vaccine management is being created at a fast pace, here DRE presents a promising opportunity to ensure effective solution of it in the vast rural landscape. **Bihar is rightly poised for a new approach in 'Solarisation' of the health sector as the last state assembly election has seen political consensus on the DRE solution for overall human development and the new government in power also made promises accordingly.** Now, Bihar essentially needs a well defined roadmap for Health and Energy integration and promoting 'Solarisation of Healthcare' system through an enabling framework which takes multistakeholder approach in realisation of the universal health coverage for benefiting all.

Ramapati Kumar

Chief Executive Officer (CEO)

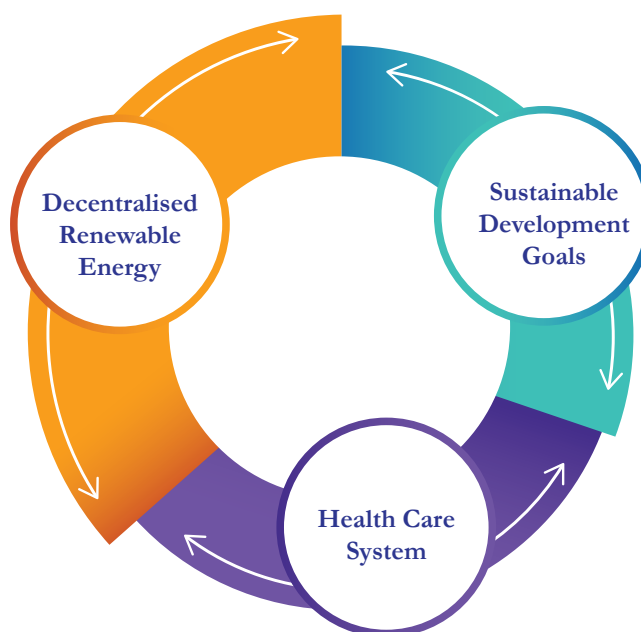
Centre for Environment and Energy Development (CEED)

1. Introduction

Health has been one of the prerequisites for achieving overall human development. As the whole world has been struggling hard to cope with the challenges of COVID-19, the health sector has been brought under the spotlight with a new approach. The pandemic has highlighted several existing systemic gaps in services, especially providing health access to the rural poor. Strengthening the public health infrastructure has never been given such prominence in recent decades.

Some recent stories of changes from around the globe have reinforced the belief that public health institutions can be strengthened by renewable energy solutions particularly in the times of natural calamities. For example, after a 2007 tornado destroyed 90% of the buildings in Greensburg, Kansas, the Kiowa County Memorial Hospital rebuilt its facilities with on-site wind turbines that provide the majority of total electrical load¹. Similarly, Boston's harbour-front Spaulding Rehabilitation Hospital installed its electrical equipment and backup energy systems on the roof so it can continue to operate in the event of extreme flooding². Kaiser Permanente, the California-based integrated managed care consortium, has a solar power system that can meet 50% of its energy needs with RE³. Thus, we can see that around the world, clinics are using solar power to run facilities and refrigerate essential medicines during distressing times as well.

Renewables have also a success story in public health systems in India. A report⁴ evaluating the role of electricity access on health outcomes in rural Chhattisgarh elaborates that facilities with solar performed better. On an average, health facilities with solar treated 50% more out-patients each month, conducted 50% higher institutional deliveries, admitted a higher number of in-patients as well as provided round the clock services. About 98% of staff reported lower disruptions in day-to-day functioning and 80% reported savings in the electricity costs.⁵ These results are encouraging for states like Bihar considering future energy consumption is likely to increase significantly across the economy, the shift towards renewable sources can help in diversifying the electricity mix, reducing the dependence on fossil fuels and increasing reliable energy supply.



Access to electricity is critical to health care delivery and to the overarching goal of universal health coverage and meeting Sustainable Development Goals (SDGs) e.g. attainment of health and well-being of people (SDG 3) and powering health facilities with clean sources of energy (SDG 7). Bihar can also strategically use renewable energy for ensuring overall development of the society.

1 <https://toolkit.climate.gov/case-studies/following-devastating-tornado-town-and-hospital-rebuild-harness-wind-energy>

2 <http://www.healthierhospitals.org/get-inspired/case-studies/partners-healthcare-redefines-resilience-and-restoration-innovative>

3 <https://www.modernhealthcare.com/article/20150223/NEWS/150229999/kaiser-to-use-renewable-energy-for-50-of-power-needs>

4 <http://www.ceew.in/sites/default/files/CEEW-Powering-Primary-Healthcare-through-Solar-in-India-30Aug17.pdf>

5 <https://www.weforum.org/agenda/2017/10/solar-power-can-reshape-our-health-future/>

2. Aims, Objectives and Research Methodology

2.1 Aim and Objectives of the Study

This report attempts to provide a snapshot of the current status of the health care and delivery system, analyses the prevailing lacunae at the public health infrastructure level and further explores the needs and possible ways of energising the health institutions through the usage of DRE in Bihar. There have been little studies done at the integral role of Health and Energy in Bihar. A Health-Energy assessment of public health centres is important to identify the real energy and health gaps in rural and urban areas. This study attempts to humbly fill this void with putting spotlight on cleaner energy transitions in public health infrastructure for enhancing the efficacy of service delivery systems to serve people in dire need.

This study intends to 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 universal healthcare.

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

- ❖ To map out the DRE potential that exists in the Health sector of Bihar and potential new job opportunities that can be created in the value chain of health services
- ❖ To present key recommendations for bringing in an enabling framework for increasing deployment of DRE as an energy-efficient sustainable energy source in the health institutions across Bihar

2.2 Research Methodology and Scope

For a better understanding of the ground reality of the DRE systems and its prospective infusion in the public health infrastructure, 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 research exercise.

For context setting, secondary literature review of past works and reports of various reputed organisations such as Ministry of Health and Family Welfare (MOHFW), Rural Health Statistics, National Family Health Survey (NFHS), Indian Public Health Standards (IPHS), Niti Ayog, Power for All, SSEF, World Bank, CEEW, ckinetics etc was done to analyse the overall gaps at the nexus of health and energy. A series of interactions also held with various health professionals and health workers e.g. Block Health Manager (BHM), Medical officer (MO) and Auxiliary Midwife Nurses (ANM), and child nutrition workers e.g. Anganwadi Workers (AWW) at various public health centres and Anganwadi centres. For this, a systematic random sampling based survey (n; 145) was also conducted to get a better picture of the energy scenario in the health institutions in different geographies of the state.

Furthermore, an analysis of various programs and schemes of the central and state government for managing health care delivery systems was done to get a clear picture of the financing mechanisms and the scope of leading private financial institutions to promote the DRE models in the health sector.

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.

3.Current Health Scenario in Bihar

3.1 Health Scenario in Bihar

Bihar, with a population of 104.1 million (Census 2011), is the third most populous state of India and it constitutes 8.6 percent of the country's total population. For rendering health services to a huge number of people, Bihar has faced challenges due to lesser availability of modern medical services in the rural hinterland, subsequently people have been largely dependent on traditional healing practices for health related ailments. Moreover, with most of the population living in the rural areas and hamlets, the health facilities are not easily and adequately accessible despite the presence of the health care delivery system run by the state government.

According to NITI Aayog's SDG Index, Bihar is placed at the bottom in progress towards UN goals, with a score of 50⁶. As per the Sample Registration System (SRS) 2016, Bihar has an IMR of 42 and a birth rate of 26.2, both of which are higher than the national average of 37 and 20.8 respectively. Bihar's performance on health indicators is poor and over the years it has witnessed high infant mortality due to lower immunisation of children and high maternal mortality because of low institutional delivery and lesser access to the health services; however it has shown praiseworthy improvement from National Family Health Survey-4 (NFHS-4) to NFHS-5 in a decade (see Figure 1).

Figure 1: Health Indicators of Bihar

Health Indicators	NFHS-4 (20015-16)	NFHS-5 (2019-2020)		
		Urban	Rural	Total
Sex ratio in total population (females per 1,000 males)	1,062	982	1,111	1,090
Infant Mortality Rate (IMR)	48	43.1	47.3	46.8
Under-five Mortality Rate (U5MR)	58	50	57.4	56.4
Institutional births (%)	63.8	84.1	75	76.2
Women whose Body Mass Index (BMI) is below normal (BMI < 18.5 kg/m ²) ¹⁴ (%)	30.4	18.7	26.9	25.6
Men whose Body Mass Index (BMI) is below normal (BMI < 18.5 kg/m ²) (%)	25.4	12.9	23.8	21.5
Total Fertility Rate (children per woman)	3.4	2.4	3.1	3.0

Bihar's expenditure on health stood around Rs. 7318 crore with an annual increase of 20.8%⁷, however, improving the status of health is still a big challenge. Bihar has consistently underinvested in its health-care system in the past. It has been ranked at bottom of 36 states and union territories of India on Human Development Index (HDI) ranking-2018. Though, the state has slightly progressed on the score of HDI which was 0.557 2015 and reached to 0.576 in 2018; yet the performance of the state is the lowest among all states and is far lower than the national average, i.e. 0.617.⁸ As per a report by NITI Ayog, Union health ministry and the World Bank the state was earlier ranked 19th in terms of accessing health services has now slipped to 20th spot in the latest report⁹.

6 https://niti.gov.in/sites/default/files/SDG-India-Index-2.0_27-Dec.pdf

7State Finances, A Study of Budgets, RBI & Budget Documents, GoB

8 hdr.undp.org

9<http://documents1.worldbank.org/curated/en/437741588839001002/text/Healthy-States-Progressive-India-Reports-on-the-Ranks-of-States-and-Union-Territories.txt>

3.2 Bihar's response to manage COVID-19 pandemic

The first case of COVID-19 in Bihar was reported on 22 March 2020 and the state went under a series of lockdowns from 25 March 2020 onwards. Bihar had deployed 48 government testing laboratories and 14 private laboratories till October, 2020 (Figure 2 & 3). It is much less than Uttar Pradesh Maharashtra and Tamil Nadu¹⁰, where more testing and sample collection facilities have been set up to detect the spread of coronavirus.

Figure 2 : Status of Covid-19			
	Confirmed	Deaths**	Cured/Discharged /Migrated*
Bihar	242399	1368	241031
India	9839929	146756	9693173

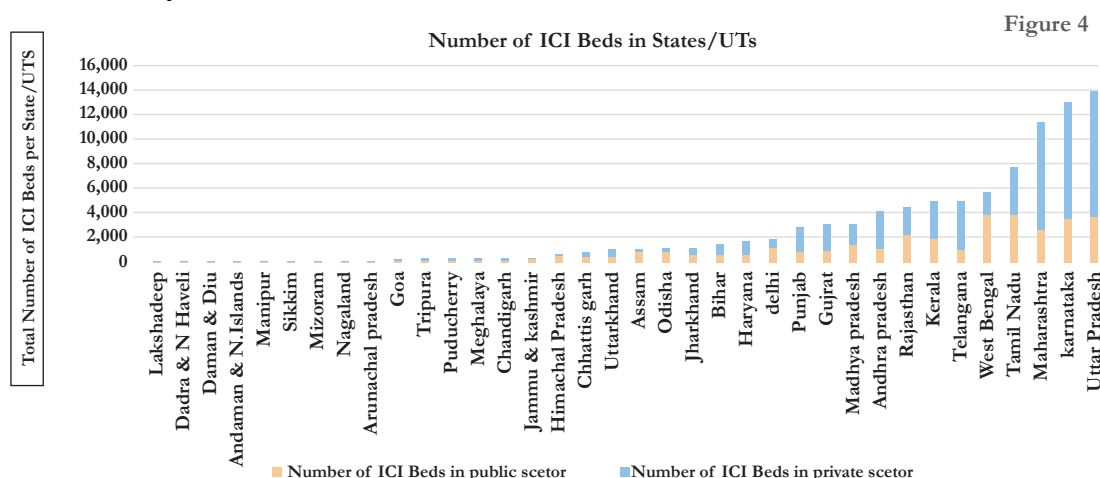
*(Including foreign nationals)
 **(more than 70% cases due to co-morbidities)
 Source: MoHFW, Oct, 2020

Figure 3 : Covid Testing Centres		
	Government Labs	Private Labs
Bihar	48	14
India	1169	982

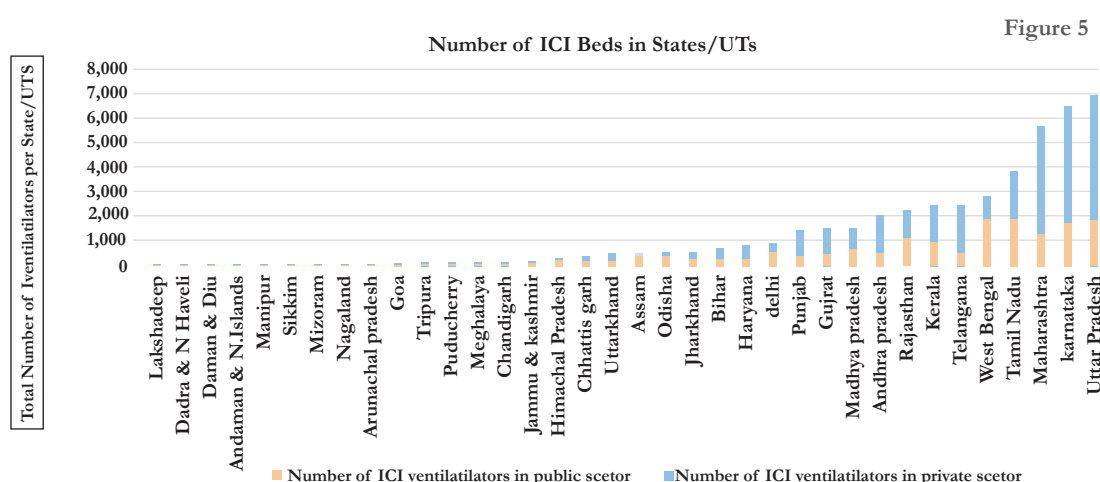
Source: Statista 2020

State-wise estimates of current hospital beds, Intensive Care Unit (ICU) beds and ventilators in reference to COVID-19^{11 12}:

Source: CDDEP Report; National Health Profile



Source: CDDEP Report



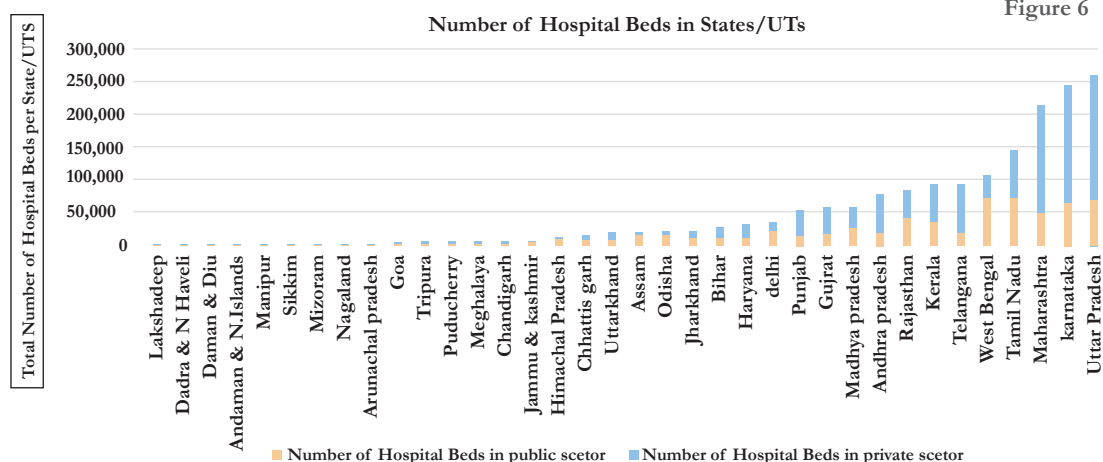
Source: CDDEP Report

10 <https://www.statista.com/statistics/1104075/india-coronavirus-covid-19-public-private-testing-centers-by-state/>

11 https://cddep.org/wp-content/uploads/2020/04/State-wise-estimates-of-current-beds-and-ventilators_24Apr2020.pdf

12 <https://www.thehinducentre.com/resources/article29841374.ece/binary/8603321691572511495.pdf>

Source: CDDEP Report; National Health Profile



Source: CDDEP Report

From the above Figures (4, 5 and 6) it can be inferred that the total hospital capacity in Bihar is very low as compared to the other larger states. Thus, treatment of the COVID patients or peoples with severe ailments place the need for rapid expansion of current capacity and modifications in routine patient care in health institutions.

Major steps taken by Bihar Government for COVID-19 Management

- ❖ The Health Department constituted a Bihar COVID-19 Emergency Response Team, which was responsible for the control and coordination of all health-related responses.
- ❖ Around 121 centres (hotels, hostels, hospitals etc) with a total 6718 beds were earmarked for COVID isolation and treatment purposes¹³.
- ❖ Bihar launched a Health Emergency Operations Centre (HEOC) in collaboration with ISRO to monitor the outbreak of Covid-19. Also "Aapda Rahat Kendras" were set up by the Disaster Management Department at District Headquarters, state borders and in other states. Around 72,100 people have benefited so far.
- ❖ Door-to-door screening campaigns run in districts in border-areas and also in an area within 3 km radius of the residence of COVID-19 positive patients.

¹³ <https://state.bihar.gov.in/cache/19/25-04-2020/Isolation-Centres-25.04.20.pdf>

4. Current Status of Public Health Infrastructure in Bihar

Bihar follows a three-tier rural health care system (see Figure 7 and 8), similar to other states of Indian union, which comprises of Sub Centres (SCs)/Sub Health Centres (SHC), Primary Health Centres (PHCs) and Community Health centres (CHCs) established in a bottom to top fashion. The State has, however, a provision of Additional Primary Health Centres (APHC) and two-thirds of the PHCs are in fact APHCs which function almost like a Sub Centre.¹⁴

Figure 7: Norms for Rural Health care System		Population in area	
Centre		Plain Area	Hilly/Tribal Area
Community Health Centre (CHC) A 30 bedded Hospital/Referral Unit for 4 PHCs with Specialized services		1,20,000	80,000
Primary Health Centre (PHC)/Additional PHC A Referral Unit for 6 Sub Centres 4-6 bedded manned with a Medical Officer Incharge and 14 subordinate paramedical staff		30,000	20,000
Sub Centre (SC) Most peripheral contact point between Primary Health Care System & Community		5000	3000
Source: Ministry of Health and Family Welfare, GoI			

This structure saw some new elements being infused when the National Health Policy-2017 recommended strengthening the delivery system of primary health care through the establishment of Health and Wellness Centres (HWCs) under 'Ayushman Bharat' and converting some of Sub Centres and Primary Health Centres; thus new nomenclature came, e.g., HWC-SC and HWC-PHC¹⁵. Despite such change, broadly it remains a three-tier structure in the rural areas.

Apart from the rural health institutions, another chain of mofussil town based hospitals, and city based mega health institutions exists. For example, at the district and sub-divisional level the Sub Divisional Hospital (SDH) and District Hospitals (DH) like Sadar Hospitals or hospitals run by Municipal corporation are placed. At the capital level, an autonomous hospital and medical college also exists.

Figure 8: Three Tier structure of Public Health institutions		
Primary Health Care	Secondary Health Care	Tertiary Health Care
Sub- Health Centre Primary Health Centre Additional Primary Health Centre	Community Health Centre District Hospital/Sub-Divisional Hospital	Medical College Apex/Super Speciality Centre
Purpose: preventive, curative and promotive services to the community	Purpose: curative and specialized care to the community and works as first referral centre	Purpose: provides super specialised/comprehensive health care services for complex ailments
Source: MoHFW, 2012-13		

4.1 Decentralised Planning and Monitoring structure with Inter-aligned departments

Bihar also follows the same model where every state has a National Health Mission (combined of National Rural Health Mission and National Urban Health Mission) and it has been designed in keeping the consideration of decentralised structure of public funded health institutions across the state. In addition, State Health Society and State Program Management Unit and their district wise units

¹⁴ https://www.researchgate.net/publication/274990930_Development_in_Bihar_Predicaments_and_Prospects_of_Health_Indices

¹⁵ https://main.mohfw.gov.in/sites/default/files/Final%20RHS%202018-19_0.pdf

are placed. The State Health Mission is aided by the District Health Mission (DHM) and Block and Panchayat level health institutions for making health-related services accessible at all levels.¹⁶ Apart from having a greater role in the State mission, the DHM monitors, directs and manages all public health institutions in the districts e.g. SCs, PHCs and CHCs where health professionals

and frontline health workers like ANMs or ASHAs work. At the grassroots level, the Panchayat Village Health Committee under Panchayati Raj Institution (PRI) prepares the village health plan and fosters crosssectoral integration of health affairs (see Figure 9). Essentially, Bihar follows a pluralistic model of health system, so there exists inter-sectoral coordination between various aligned departments. For Instance, with regard to NHM, there exists policy guidelines about institutional mechanisms at the central, state and district levels for coordination between the Departments of Women and Child Development, Rural Development and Panchayati Raj and other relevant departments with the aim of policy level convergence and streamlining planning, review and monitoring work.¹⁷

Decentralised Health Service Management

Figure 9

Source : NHM



4.2 Flagship schemes in Health sector

The Government of India has several important health initiatives¹⁸. As a constituents of Union of India, the state of Bihar implements these schemes and programs and similarly many of central schemes such as Aayushman Bharat, NHM (NRHM+ NUHM), Integrated Child Development Scheme, National Program for Control of Blindness, National Leprosy Eradication Program, 'Janni Suraksha Yojna', 'Janni Shishu Suraksha Karyakaram' are being implemented in the state for providing arrays of services to the people.

4.3 Infrastructural and Manpower Gaps in the Health centres

Considering the current pandemic scenario and the poor condition of health care centres in the state, it presents an unusual situation where each health centre is burdened with more number of patients to deal with. The data shown in the Figure 9 and 10 indicate that there is a 83% shortage of the CHCs and 46% of PHCs and 53% of shortage of SCs in Bihar. This speaks about the greater need to expand health institutions across the state. Further, the trend shows (indicated in Figure 12 and 13) that if health facilities remain at current levels, the rising population over the next two decades (even with slowing population growth rates) will reduce the per capita availability of hospitals in Bihar.

16 <https://nhm.gov.in/index1.php?lang=1&level=2&sublinkid=1080&lid=146>

17 https://academic.oup.com/heapol/article/31/suppl_2/ii25/2404382

18 <https://main.mohfw.gov.in/sites/default/files/8565929279Major%20Schemes%20%26%20Programmes.pdf>

Figure 10 : Number of Functional Health Centres (March 2019)

Sub Centres	PHCs	CHCs	HWC- SCs	HWC- PHCs	Sub Divisional Hospital	Hospital District
9865	1480	150	84	514	55	36

**FIGURE 11: Shortfall In Health Facilities In Bihar In Rural Areas
(As On 1 July 2019, As Per Estimation Of Mid Year Population)**

Sub Centers and HWC-SCs				PHCs and HWC-PHCs				CHCs			
Required	In position	Shortfall	% shortfall	Required	In position	Shortfall	% shortfall	Required	In position	Shortfall	% shortfall
21337	9949	11388	53	3548	1899	1649	46	887	150	737	83

Source: RHS 2019, MoHFW

Bihar, owing to its high population density, has a shortage of health facilities to a considerable extent. The Indian Public Health Standard (IPHS) sets certain norms in terms of population, required facilities

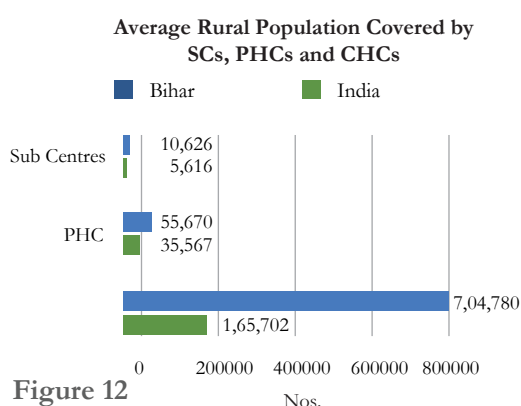
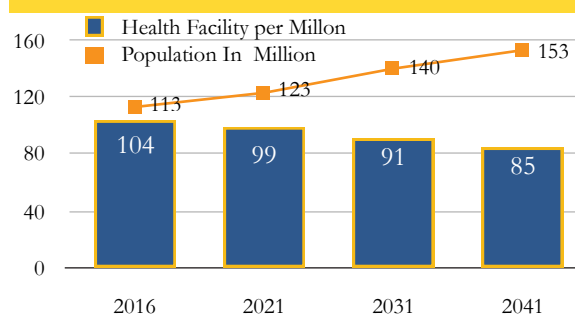


Figure 12

Figure 13: Health Facilities per million population (estimated)



Source: Economic Survey of India

and manpower and other facilities for different types of public health institutions for better health service delivery¹⁹. The Rural Health Statistics (2009, 2015) of MoHFW also indicates that Bihar lags behind in terms of fulfilling the basic services and infrastructural arrangements to many health centres in the village level. A majority of the PHCs and CHCs are functional with their own government

Figure 14: Building Position for Health Centres in Rural Areas (2019)

	Nos.	Functioning of Health centres				
		Govt. Buildings	Rented Building	Rent free panchayat / society building	Building under construction	Building required to be constructed
Total No. of subcenters +HWC-SCs functioning	9949	5643	3277	1029	45	4261
Total No. of CHCs functioning	150	150	0	0	0	NA
Total No. of PHCs +HWC-PHCs functioning	1899	1493	384	22	45	NA

Source: MoHFW: RHS 2019

building, however many SCs, close to 45%, do not have such a facility and they largely function on rented accommodation or function under panchayats/society (see Figure 14).

Apart from physical structure, most of the health centres have huge shortage of manpower in terms of health workers/ANMs/ASHA workers (see Figure 15) and most of the sub-centres have either one or two ANMs as frontline health worker and they are overburdened in the present crisis of COVID 19.

¹⁹ https://www.researchgate.net/publication/274990930_Development_in_Bihar_Predicaments_and_Prospects_of_Health_Indices

general, Bihar also lacks a shortage of doctors as one government doctor serves 28,391 people²⁰. Similarly, there is a shortage of basic facilities as mentioned in Figure 15, 16 and 17, which points to further strengthen the healthcare chain in the state. Only 68 FRUs seem to be operational in Bihar and they do not have any Mobile Medical Unit (MMUs)²¹. Indeed, there is an urgency to expand the whole setup to improve the health services and this brings an opportunity where DRE solutions can play a big role.

Figure 15: HEALTH INFRASTRUCTURE AND HUMAN RESOURCES IN BIHAR

Particulars	Sanctioned	In position	Shortfall
SHCs	1459	8909	6050
PHCs	2489	1648	841
CHCs	622	70	552
MPW (female) / ATM at SHCs & PHCs	10557	8904	1653
Health Worker / Multi Purpose Worker (Male) - SHCs	8909	1240	7669
Health Assistant (Female) / LHV - PHCs	1648	491	6050
Health Assistant (Male) -PHCs	1648	634	1014
Doctor - PHCs	1648	1850	Nil
Obstetricians & Gynecologists - CHCs	70	21	49
Physicians - CHCs	70	38	32
Pediatricians - CHCs	70	17	53
Total specialists at CHCs	280	104	176
Radiographers	70	15	55
Pharmacists	1718	439	1279
Laboratory Technicians	1718	135	1583
Nurse / Midwife	2138	1425	713

(Source: RHS Bulletin, March 2007)

Infrastructure Facilities at Primary Health Centres in Rural Areas

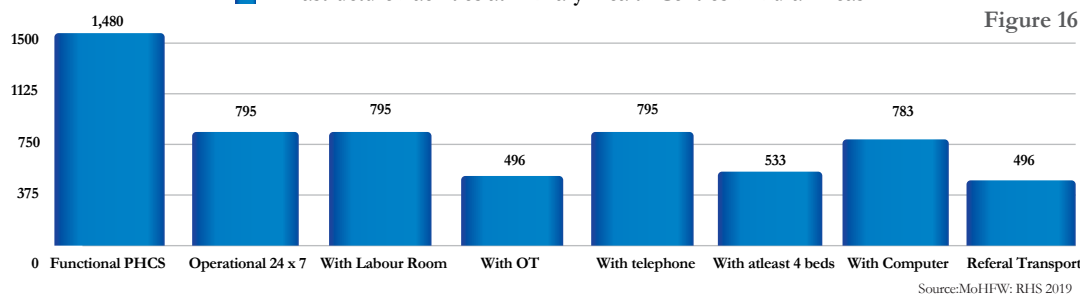


Figure 16

Infrastructure Facilities Available At Sub Centres in Rural Area

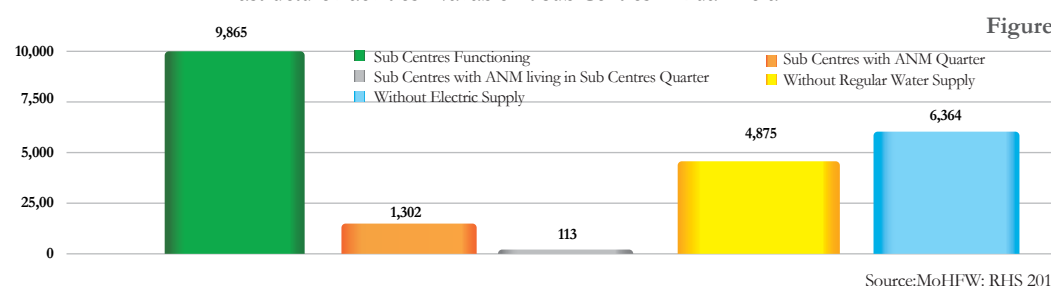


Figure 17

Infrastructure Facilities at Community Health Centres in Rural Areas

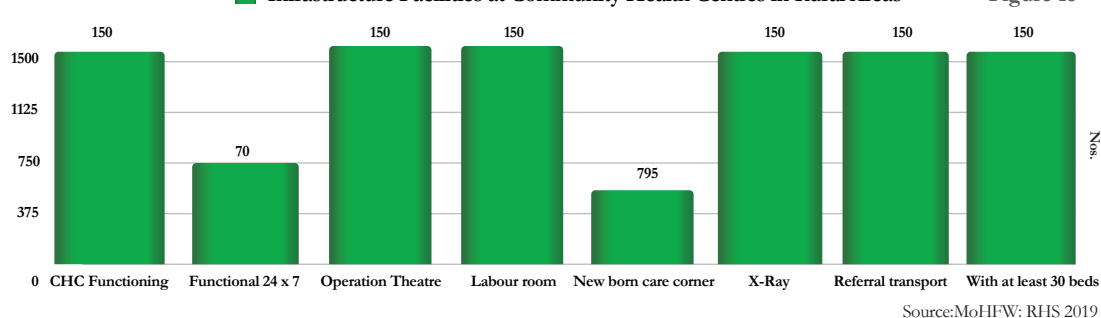


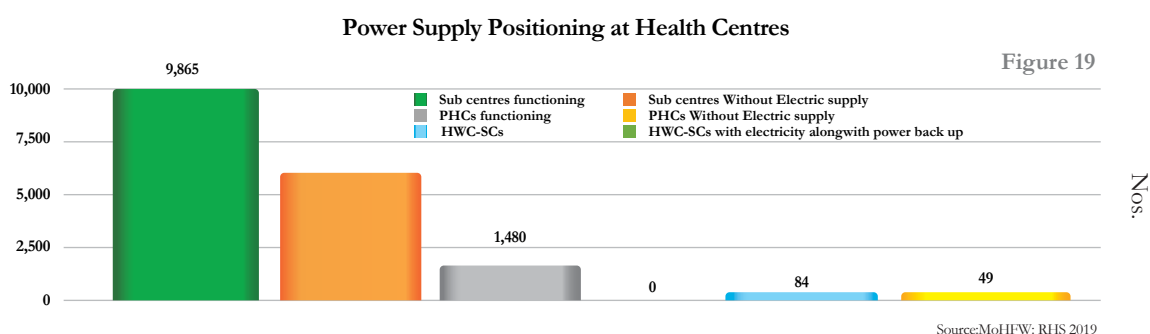
Figure 18

²⁰ https://www.downtoearth.org.in/dte-infographics/61322-not_enough_doctors.html

²¹ https://nhm.gov.in/New_Updates_2018/Quarterly_MIS/march-2020/High_Focus_States-Other_than_NE_march-2020.pdf

4.4 Energy Gap in Health Centres

Electricity access enhances access to quality essential health care services and contributes in making health systems more resilient. Driven by round the clock demand, health care is one of the biggest energy consuming sectors. Access to power in the medical centres is a significant determinant of the efficacy of health service delivery as it is required for conveyances, stockpiling of immunisations, the supply of clean water as well as retention of skilled staff. In rural areas, primary healthcare is provided through the network of PHCs & SCs, which act as a last-mile service delivery for the people. With the



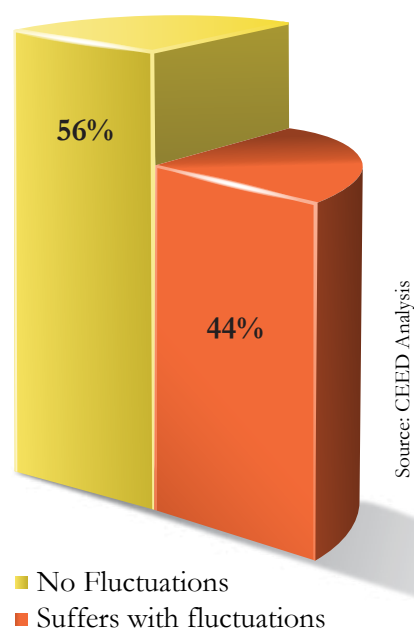
lack of electricity access or supply of quality electricity, the rural centres also struggle with procuring necessary functional equipment (like a cold chain, delivery and newborn care equipment).

Figure 20

Around 64.5% of the SCs do not have a proper electric supply which is the backbone of rural health care systems (see Figure 19). Electricity is required not only for functioning of the equipment or general needs but is also essential for sanitisation, sterilisation and drinking water supply purposes as well.

The power supply in the state has improved considerably but quality electricity supply is still an issue, which was substantiated by our survey findings that indicate huge voltage fluctuations in the health centres posing a deterrent for well functioning of the health equipment (see Figure 20). There is a need to expand the philosophy of effective design infrastructure and evolve it at every level of health care delivery.

Voltage Fluctuations at Health Centres



5. Key Findings of the Survey

For getting an idea of the current status of the various resources available at the health institution in rural areas, CEED conducted a primary survey with the health professionals e.g. Block Health Manager, Medical Officer, ANM and AWW working at PHCs, CHC's, SCs, Referral Units/hospitals and Anganwadi centres. Questions on quantitative and qualitative aspects were included in the questionnaire to collect valuable insights such as: current state of electricity supply, duration of power supply along with the frequency of power cuts, power backup options including solar PV systems, availability of doctors and existing manpower gap, average number of general patients, number of maternity cases and newborn per month, and overall perception of the staff regarding the importance of electricity in delivering various healthcare services.

The findings reveal that out of a total 145 PHCs, CHCs, APHCs, RUs and SCs surveyed, most of them were connected to the grid, only few of the SCs were unelectrified. Our survey findings validates the lack of reliable and consistent power supplies in the rural primary health centres. For instance, about 73% of health centres operate gensets for about 0-10 hour (see Figure 21), whereas 65% of the health centres received power supply for more than 16 hrs per day (see Figure 22). These are core concerns since voltage fluctuations can cause malfunctioning of complex medical devices and create an additional cost for health centres.

While interviewing frontline health workers (e.g. ANMs at various SCs), it was observed that these centres deserve special attention as there exists structural deficits and organisational deficiencies which do not meet the IPHS guidelines (see Figure 23). Their response also validates that the condition of most of the SCs is poor and many of these centres run on rented accommodation as they do not have their own building (see Figure 24) and there is a huge shortage of ANMs in most of the SCs as well.

Daily operational Hours of Diesel Gensets (Avg.)

Figure 21

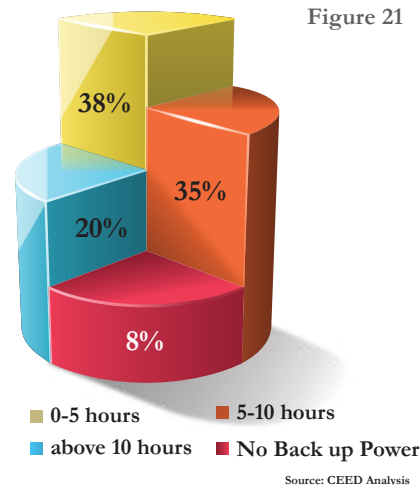
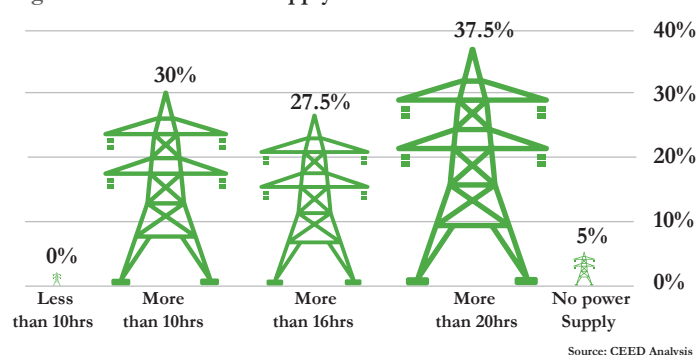


Figure 22

Power Supply at Health Centres



Health Infrastructure at Public Health Centres

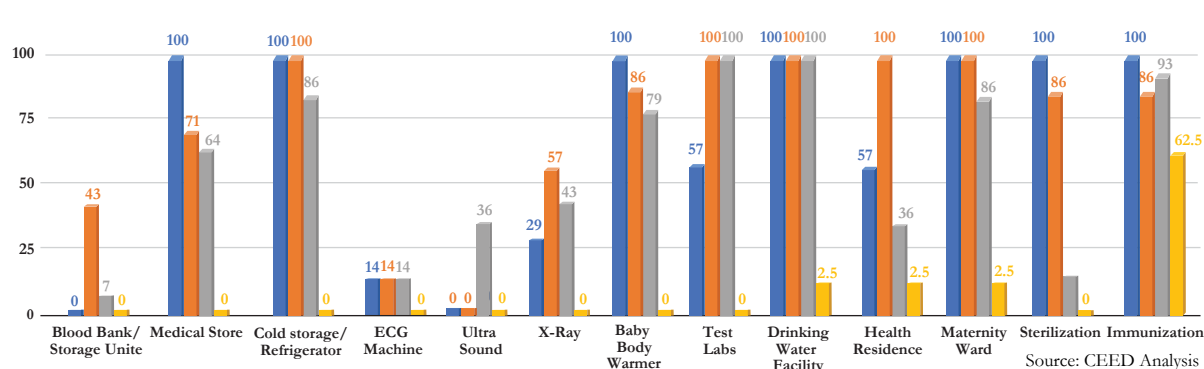


Figure 24

While interviewing Anganwadi Workers, who are regarded as frontline nutrition workers in villages, it was shared by them that they either function on rented accommodation or align their activities with nearby SCs/health centres. Most of the Anganwadi centres were forced to close and primary health and nutrition programmes almost ceased to operate during the COVID era. It also came to light that most of the health centres suffer in the terms of provision of separate toilets for men and women which was also substantiated by the MoHFW report as shown below in Figure 25 that women workers face problems.

Building Position of Health Centres

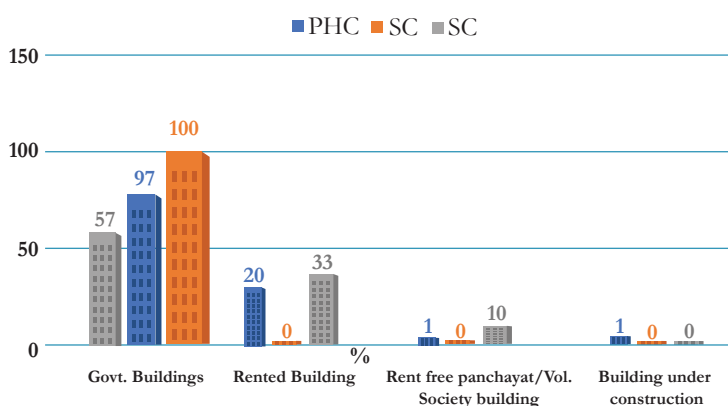


Figure 25

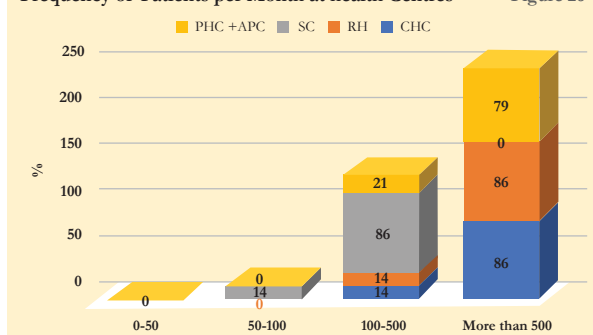
Hygiene facilities at Health Centres

Sub Center			Primary Health Center			Community Health Center		
Sub Centre Functioning	With Separate Toilet for Male & Female Patients	With Toilet facility for staff	PHCs functioning	With Separate Toilet for Male & Female Patients	With Toilet facility for staff	No. of CHCs functioning	With Separate Toilet for Male & Female Patients	With Toilet facility for staff
9949	3742	2554	1899	375	272	150	0	0

Source: MoHFW: RHS 2019

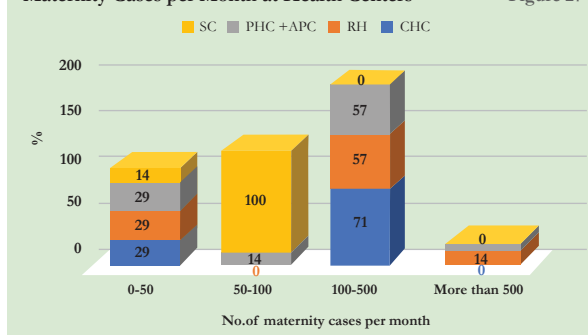
Owing to serving a large population in the areas, the health centres face huge rush in terms of visits of patients as well as in maternity cases (see Figure 26 and 27), which impacts effective services as they can only be fulfilled with availabilities of efficient equipments, support staff and basic facilities such as electricity and water. To meet the deficit in electricity access, health facilities rely on expensive electricity backup options like diesel generators that have significant cost implications and may be difficult to procure in remote areas. Electricity backup is necessary not only for emergency services but also for the extension of electricity to staff quarters so that staff can stay at the facility for providing emergency and delivery services in the night.

Frequency of Patients per Month at health Centres Figure 26



Source: CEED Analysis

Maternity Cases per Month at Health Centres Figure 27



Source: CEED Analysis

6. Scope of DRE in Health Value Chain

A guaranteed and quality electricity supply has a greater likelihood for providing better health services. In conjunction with energy efficiency initiatives, powering health facilities with renewable energy sources can minimise reliance on fossil fuels, and reduce carbon emissions and operational costs. It may also promote energy independence and resilience in the health sector particularly in the face of wider disruptions to the energy grid orenergy supply chain. The achievement of SDG-3 and the realisation of universal health coverage will not materialise if health facilities delivering vital care do not have reliable electricity. The multidimensional approach (see Figure 28) of electricity access has been presented here from the World Bank framework, which calls for a comprehensive understanding of electricity access that extends beyond mere connectivity but includes quality, reliability, and affordability of health services. The Figure 29 indicates a brief sketch of existing health value chain, while Figure 30 presents an infusion of DRE element therein.

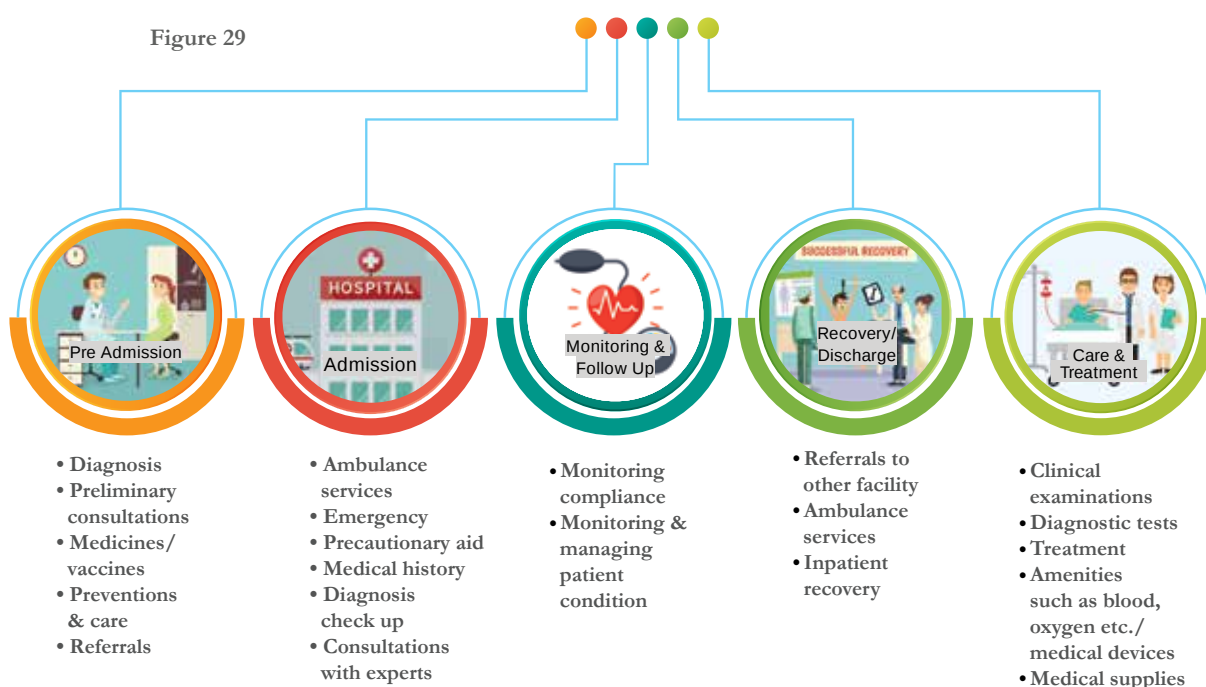
Figure 28

Source: World Bank



A Snapshot of Health Care Value Chain

Figure 29



Source: CEED Analysis

Scope of DRE in the Health Care Value Chain

Figure 30



Source: CEED Analysis

6.1 DRE in Healthcare Value Chain

Cold Chain for Vaccine Refrigeration and Storage: A Cold chain equipment is essential for the storage of vaccines and drugs. Accessibility of health services at the PHC also guarantees safe delivery of infants and routine child immunisation and vaccination cycles. Loss of vaccines and medications due to non-functional equipment in the cold chain dramatically contributes to the expense of the public health, either due to lack of power or due to the technological problems. Usually, vaccines are kept for as long as one month at district and rural health centres and they need a support of steady temperature of 0°C (32 °F) to 8°C (46 °F). If the immunisations are given at temperatures below this range the strength is lost forever. Here, DRE can support the cold chain through reliable supply.

Powering & Lighting: For every health centre, electricity backup is necessary not only for the provision of essential health services but also for electricity to staff quarters so that employees can stay in the facility to provide emergency and delivery services in the night. During disruption from the main grid, alternative power can be supplied through the DRE solutions.

Communications: Communication and telephone links in rural health centres would greatly boost the administration of medical care. Communications are also important for routine functions of service and administration, including logistic arrangements, immunisation monitoring and reporting, and disease diagnosis assistance and other medical procedures.



Sterilisation: It requires very high temperatures (about 120°C/250°F), where thermal energy is relatively more suitable rather than the electricity. The required temperature can be supplied at a lower cost by a solar thermal collector, particularly in areas with great sun insolation.

Water Treatment & Hygiene: World Health Organisation (WHO) estimates that water-borne diseases are responsible for 50,000 deaths daily. Thus, provision of clean drinking water is necessary not only for quick recovery of patients but maintaining the health and hygiene of the frontline health workers as well. In times of COVID, hygiene has turned out to be one of the most essential parts of prevention and cure phase which can be solved through regular supply of electricity through sustainable solutions such as DRE Hot Water facility.



Electrical Appliances: With the use of DRE solutions many appliances can be electrically operated round the clock and even they can work in isolation or in a mobile way. The devices which are quite expensive in nature also require to be provided with quality supply of electricity which can be made possible through the DRE solutions such as stand alone power plants.



Figure 31: Essential electrical appliances for enhancing services

Service Provided	Electrical equipments	Capacity (watt)
Maternal and child health care	Radiant Warmer	600-700
	Sterilizer/ Autoclave	1200
	Suction Machine	200-230
	Phototherapy Unit	270
	Heat source for a new born (bulb)	200
Immunization	Refrigerator	100-120
	Ice- lined Refrigerator	115-370
	Deep freezer	120
	Room Heater	1000/150
Physical Medicine and Rehabilitation	Shot wave diathermy	500-1000
	Neuro muscular Stimulator	
	Infra red lamp (therapy)	
	Ultra sound therapy	800-1000
Dental Care	Dental Unit	800
Operation Theater	X- Ray view Box	20-90
	ECG Machine	30
Disease control	Nebulizer	50-60
General	Computer	120
	Tube lights	20
	fans	75
	Gyaser	
	Light examination, mobile, 220-12 V	20
Laboratory	Centrifuge	242
	Incubator	400
	Haematology Mixer	28
	Haematology Analyzer	230

Source: IPHS Revised Guidelines 2012

Mobile Medical Unit: The main idea of Mobile Medical Unit is to make it easier for people living in rural, under-served and unreachable places for getting access to public health care. The goal of this innovation is to bring healthcare, especially in rural and under-served areas, to the doorstep of the population. The programmes of the MMU are expected to follow the technological and service quality requirements of a primary health centre.



Baby Body warmer: The Body heater is a system for body warming with heat. This instrument helps to regulate the baby's body temperature and limit the rate of metabolism. Babies are placed on a radiant warmer for a few hours directly after birth in some places witnessing very cold weather. This instrument also runs on solar energy.



6.2 DRE as a budget friendly option

According to an analysis by Brookings India based on the National Sample Survey Organisation (NSSO) data, India's average spending on health is Rs 724 per person per year, whereas Bihar spends Rs 348 per person per year that is less than the half of the national average. The analysis also suggests that the Bihar has the highest dependence on private health-care services among Indian states with around 22 lakh households of the states facing catastrophic health expenditure²². Here DRE paired with efficient medical equipment sustainable service delivery model and financing can be used to transform health care systems affordably at an initial capital expenditure of less than USD 0.40 (INR 30) per person.²³ These steps can reduce diesel and energy costs and improve access to timely and efficient health services. For remote regions, it can also reduce spending on several out-of-pocket expenses. The DRE can solve this problem at an initial capital expenditure of less than USD 0.40 (INR 30) per person²⁴.

Figure 32: Scenario of Health Expenditure

Category	Bihar	India
Spent on health per person per year	Rs. 348	Rs. 724
Proportion of private in-patient cases	44.60%	56.60%
Proportion of private out-patient cases	91.50%	74.50%
Population covered by health insurance	6.20%	15.20%
Household with catastrophic health expenditure	11%	13%

Source: Brookings India's analysis of NSSO data

²²<https://www.telegraphindia.com/india/revealed-what-ails-health-in-bihar/cid/1485871>

²³ <https://www.powerforall.org/news-media/press-releases/indian-leaders-call-improvement-rural-healthcare-solarization-of-clinics>

²⁴ https://www.brookings.edu/wp-content/uploads/2016/12/201612_Health-and-Morbidity.pdf

6.3. Stories of DRE for optimum healthcare and Covid management

Several systemic service gaps have been highlighted by the ongoing COVID-19 crisis and one of them is insufficient healthcare facilities. The COVID-19 pandemic calls for revamping Bihar's rural health care system beginning with enhancing access to reliable electricity. DRE is an exciting opportunity to support the healthcare system and this can be seen by two case studies from Bihar that presents enormous possibilities DRE can bring in for saving lives and strengthening health institutions.

CASE Study-1

Solar Plant at Kurji Holy Family Hospital

The Holy Family Hospital Management with a vision to reduce the cost of electricity and carbon footprint took an initiative to install a solar photovoltaic power plant in 2015. Around 60 percent of the electrical load is now being fulfilled by the solar system. It also enables lighting services in the operating theatres and supports baby heaters, along with general facilities such as drinking water and street light in the premises. This system of 10 kWp capacity provides a backup of 6 hrs as well.

Key Impacts:

- ❖ Better and improved health services to the patients
- ❖ Efficient roof space utilisation
- ❖ Contributing to the nature as an eco-friendly model
- ❖ Reduces carbon footprint due to less dependency on diesel genset
- ❖ Enhance energy based health amenities in the hospital
- ❖ Reduction in electricity bills
- ❖ Mitigation of cost of diesel
- ❖ Tax savings
- ❖ Zero issues in the last 5 years



CASE Study-2

Solar powered COVID care center at Vistex Hospital, Patna

Collaborating with Vistex Hospital the Doctors for You and the Selco Foundation launched a project to solarize a hospital to urgently cater to COVID-19 patients in an area where pandemic care facilities were not available before. At Vistex Hospital in Masarhi, Patna, a 50-bed solar powered centre including out-patient department and in-patient care with ICU facilities, laboratory testing, and staff quarantine facilities has opened. This 100% off-grid facility is powered by a 15 kWp solar power plant to ensure 24x7 reliable power. By using energy-efficient materials and equipment, the facility saves 58 percent of the overall energy bill.

Key impacts:

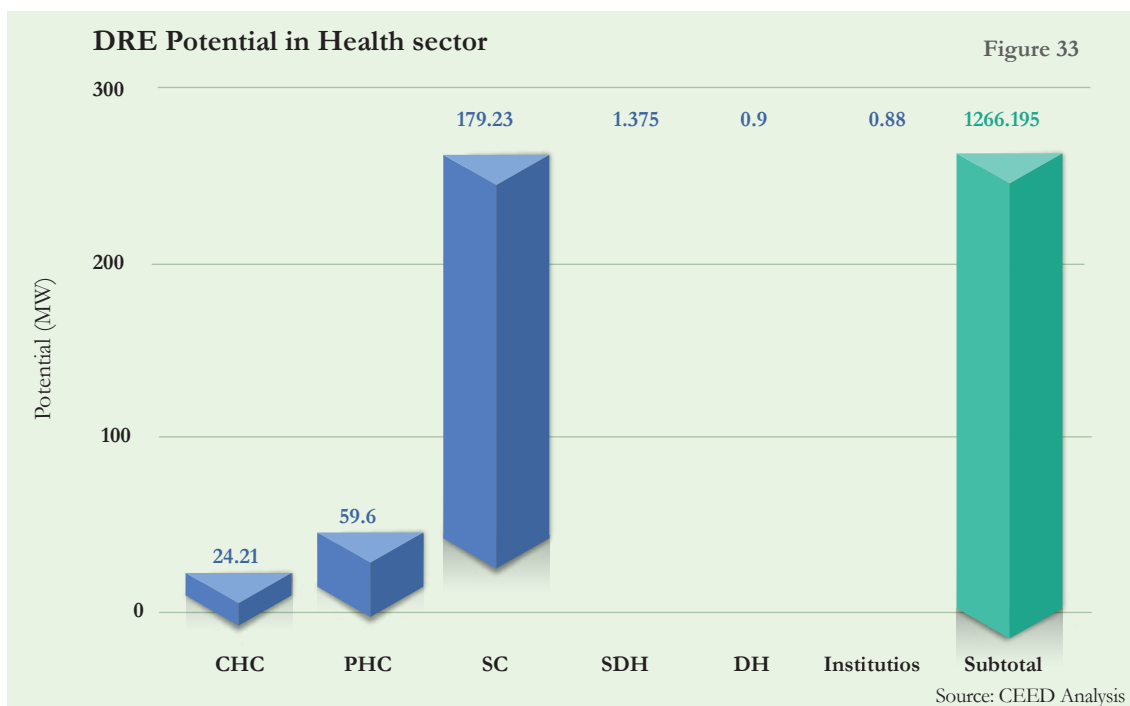
- ❖ Better and improved health services to the COVID-19 patients
- ❖ Better lighting facilities for health care workers in their residence
- ❖ Efficient roof space utilisation
- ❖ Eco-friendly model positively contributing to the nature
- ❖ Reduces the carbon footprint
- ❖ Reduction in electricity bills
- ❖ Mitigation of carbon emission by diesel
- ❖ Safety of medical equipment



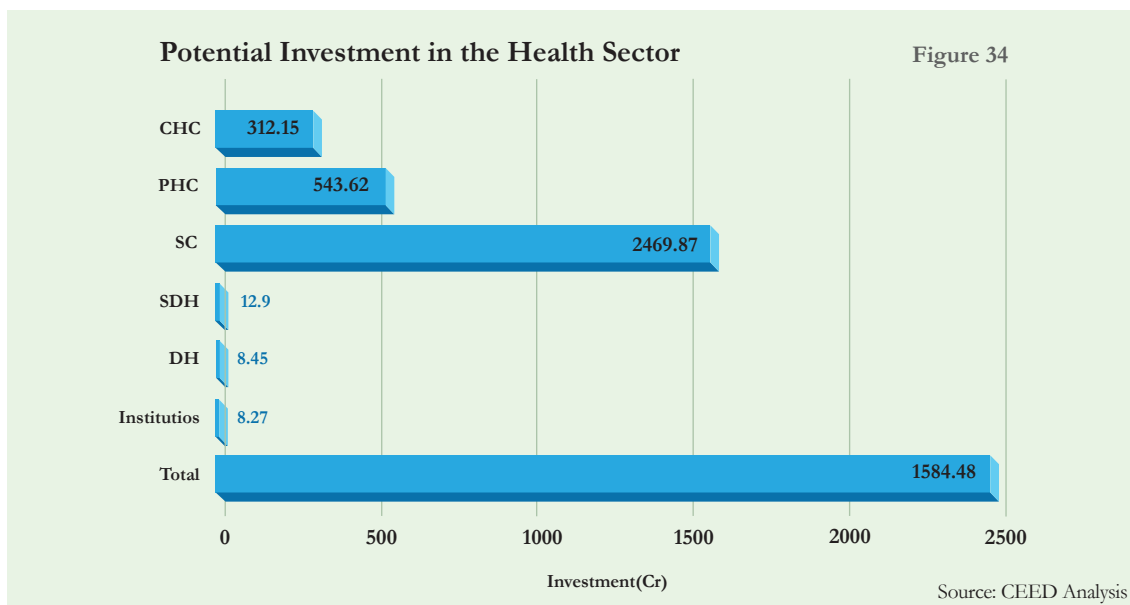
7. Potential of DRE in Health Sector

DRE has a potential of 266 MW in the Health Sector

DRE has a potential of around 266 MW in the health sector due to its suitability and decentralised nature in the rural areas (see Figure 33). Our study also indicates that the health sector has investment potential of Rs 2470 crore in DRE segment as shown in Figure 34. As the costs of renewable energy technologies have fallen in recent years, they have become more affordable for health facilities both as primary or backup energy sources. While PV systems seem to be limited in capacity, they offer somewhat greater reliability. Energy initiatives in health facilities may range from stand-alone off-grid and micro-grid solutions using a mix of renewable and/or fossil fuel-based technologies to large-scale grid expansion around centralised power plants.



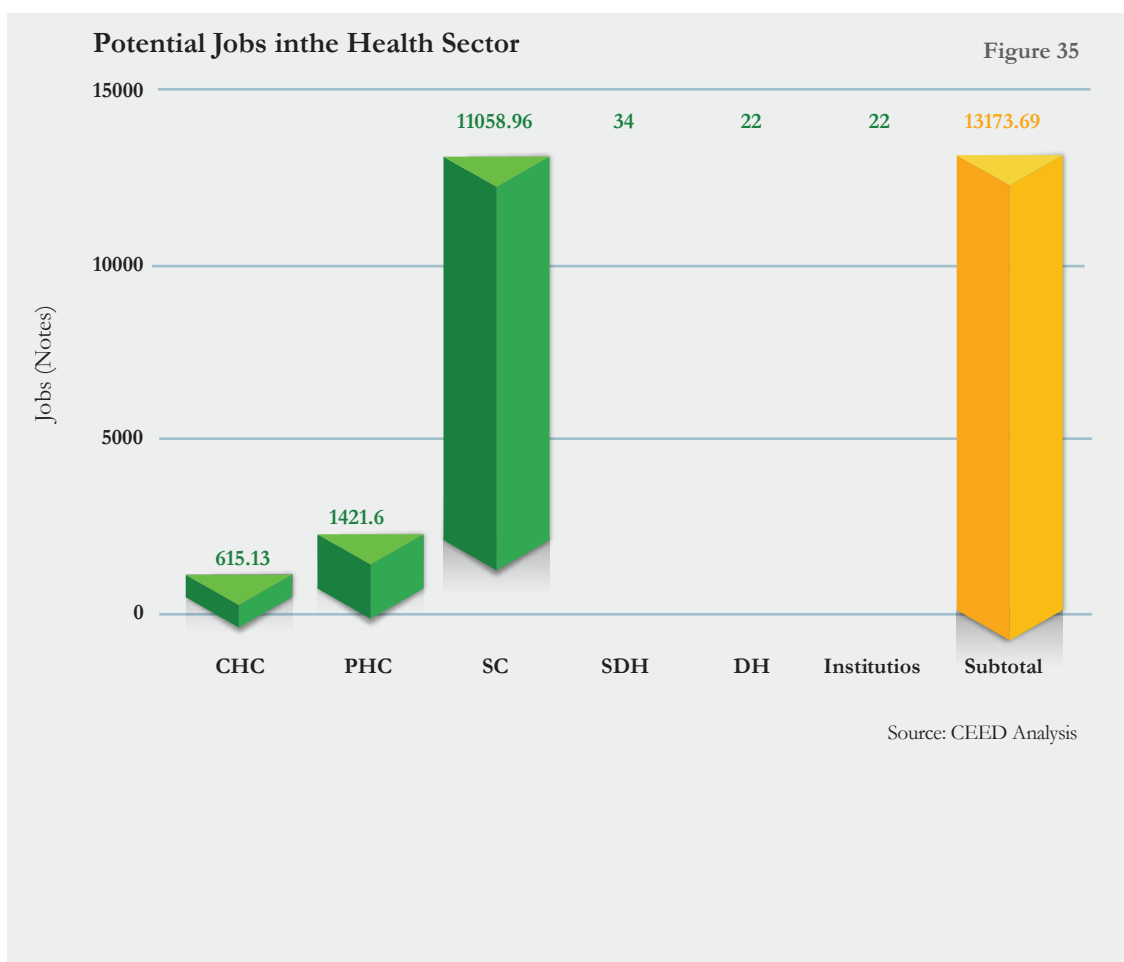
DRE has an investment potential of Rs. 2470 Crores in the Health Sector



8. Potential New Jobs in Health sector from DRE

DRE can create 13,173 new job opportunities in the Health Sector

The capacity addition of 266 MW in the DRE segment will help in creation of 13,173 new jobs (see Figure 35) in Bihar. The estimated job creation here has been derived in the lights of the methods adopted by various 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 applications²⁵. 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^{26 27}. CEED’s analysis is based on these calculations in reaching an estimated figure on these new jobs.



²⁵ <https://www.powerforall.org/application/files/8915/6310/7906/Powering-Jobs-Census-2019.pdf>

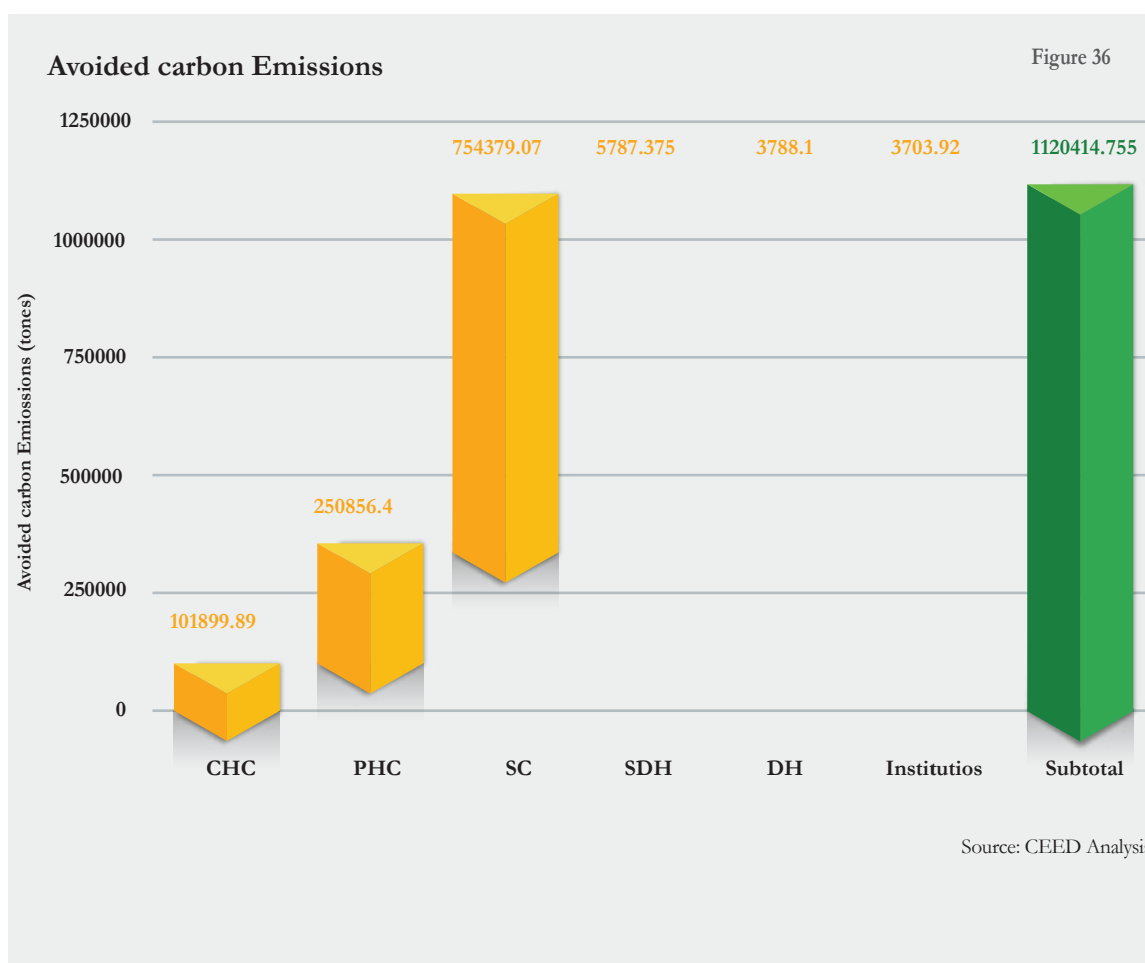
²⁶ [file:///C:/EEW-NRDC-Greening-India-Workforce-report-20Jun17.pdf](https://www.ceew-nrdc.org/~/media/Files/IRENA/Agency/Publication/2019/Jun/IRENA_RE_Jobs_2019-report.pdf)

²⁷ https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jun/IRENA_RE_Jobs_2019-report.pdf

9. Carbon Savings through DRE in Health Sector

DRE can contribute in avoiding 11,20,414 tons of CO₂ emissions

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. DRE can significantly contribute in meeting the SDGs related to reducing poverty, energy security and bringing in several environmental co-benefits as an environment-friendly technology. The reduction in energy-related CO₂ emissions is at the heart of the sustainable energy transition. CEED's analysis indicates that more uptake of DRE and energy efficiency measures can avoid over 11,20,414 tons of CO₂ emissions which is equivalent to 2,19,573 passenger vehicle driven in a year or carbon dioxide emissions by burning of 1,119,863,688 pounds of coal²⁸.



²⁸ <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>

10. Enabling Ecosystem for Strengthening Health infrastructure

Considering the current status of health infrastructure, Bihar urgently needs to bring in an ecosystem which takes a holistic approach for a comprehensive public health system with improving energy access across all levels for rendering effective service delivery to the people in dire

10.1 Policy framework for strengthening Health-Energy Integration

Traditionally, infrastructure for healthcare largely includes equipment and physical building, however as the Indian Public Health Standards lays emphasis on electricity availability it brings energy as one of the main elements in the idea of health service delivery.

The Health-Energy integration can be seen through two perspectives; first, ensuring the delivery of essential health services with improved electricity access, and second, enhancement of health services leading to better usage of electricity. However, it has often been seen that²⁹ despite the intertwined relationship between energy and health sectors, these two have been dealt separately and they seldom work together in practice. In fact, to capitalise the potential of clean energy for health care institutions, collaboration between the health and energy sectors is highly required.³⁰ Effective delivery of energy also requires a strong energy supply ecosystem encompassing laws, policies, regulations, markets and institutions to support equitable access to energy and its efficient use.

It is also important to note that not only bureaucratic system usually immerse in the policy exercise but partnering agencies like bilateral and multilateral donors/funders, academia, research think tank, knowledge and technical partner and actors from the outside of governance systems like civil society organisation and community based organisation also relay their expertise, domain knowledge and concern, demands and suggestions through array of measures. Thus, Bihar essentially needs a well defined roadmap for Health and Energy integration aided by an enabling framework which takes a multi-stakeholder approach in realisation of universal health coverage.

10.2 Access to Finance to upscale DRE models

Health is a subject in the concurrent list of Indian Constitution, hence the Union and States both have the legislative and financial oversight. However, the central government is the key actor in designing health policies and programmes due to its greater spending ability and availability of better technical resources. Health financing is important for funding for health projects for obvious reasons e.g. access through prepayment and pooling of funds in preference to direct out-of-pocket payments; and using funds for promoting efficiency and equity.³¹ Generally, health related funding is released through two channels³², i.e; through the state budget and directly through the State Health Society or NHM. However, one of the deepening concerns is that India's (and Bihar as well) health care system is characterised by low levels of spending.³³ According to the National Health Profile-2018, India is amongst the countries with least public health spending trend, despite the recurrent demand from various quarters that it must be minimum 5% of the GDP.

29 <https://www.selcofoundation.org/wp-content/uploads/2017/04/Concept-Note-%E2%80%99Health-Energy-Nexus%E2%80%9D.pdf>

30 <https://www.seforall.org/news/energy-and-health-making-the-connection>

31 <http://www.cbhidghs.nic.in/WriteReadData/l892s/Chapter%204.pdf>

32 <http://statehealthsocietybihar.org/pip2010-11/statepip-2010-11/statepip-2010-11.pdf>

33 https://www.nipfp.org.in/media/medialibrary/2013/04/wp_2012_100.pdf

As per a study, Bihar spent Rs 491 per capita on health, which is less than half the Indian average and equal to spending 1.33 per cent of its GDP on health.³⁴ Another study³⁵ indicates that health expenditure trends in Bihar between 2007-08 and 2013-14 has been very low actual spending along with low budgets, where on an average 25 percent of the budget is unused. During 2018-19, Bihar failed to spend even a third of Rs 88.5 crore given by the Centre to upgrade its existing primary health centres (PHCs).³⁶ Thus, it gives an impression that resource scarcity is compounded by low budget utilisation, which impacts the overall performance of the health sector. Therefore, the state machinery needs to enhance its ability and efficiency to spend money more effectively.

A dedicated state fund should be provisioned that will strengthen the health centres making them self-reliant in wider adoption of solar applications and doing away with diesel genset. Additionally, adequate financing can be explored through bilateral and multilateral aid from development agencies, foreign funding from philanthropic foundations, corporate social responsibility supports, and private domestic foundations.

10.3 Access to Innovative Technology and Capacity Building

There have been various models, like Chhattisgarh and North-East states have shown, that have given impetus to the idea of 'Solarisation of Health' in India.³⁷ These models have emphasised that energy efficient medical devices have the potential to generate considerable savings for health facilities in resource-constrained environments. In this scenario, government support as well as public-private partnership can be directed towards procuring more energy efficient medical equipment in health facilities which usually suffer from power intermittencies. The majority of medical devices in the market today are extremely inefficient in terms of power use thus raising the financial burden. It is important to encourage manufacturers to build more reliable, ruggedised appliances suitable for rural health services.³⁸ Giving due prominence to climate change and human health incentivising the usage of energy efficiency standards and green building codes should be promoted.

Moreover, capacitation and operation & management is the key for ensuring a techno friendly environment in the health institutions. So, adequate training of health center staff on basic PV system maintenance for system efficiency and on-site troubleshooting is highly required which can enhance and build the overall capacity of the rural health system to enable it to effectively handle increased load and efficient service accordingly.³⁹ This can be facilitated by laying suitable terms of service contracts between private DRE providers and the state health mission, the state renewable development energy agency (like BREDA in this case), which can take care of maintenance of technological systems and other equipment for better services.

34 https://www.downtoearth.org.in/dte-infographics/india_s_health_crisis/index.html

35 <https://cdn1.sph.harvard.edu/wp-content/uploads/sites/2031/2017/01/Tracking-financial-resources-for-primary-health-care-in-BIHAR-India.pdf>

36 <https://economictimes.indiatimes.com/industry/healthcare/biotech/healthcare/bihar-used-a-3rd-of-central-funds-for-health-centres/articleshow/70050061.cms?from=mdr>

37 https://iorec.irena.org/-/media/Files/IRENA/IOREC/2018/Presentations-Healthcare/HEALTH2018_PS1_Decentralized-Renewable-Energy-in-Healthcare-The-energy-health-nexus_Sudarshan.pdf?la=en&hash=721E9BB4C5B7644ED1785616926D35D977204323

38 <https://www.powerforall.org/news-media/press-releases/indian-leaders-call-improvement-rural-healthcare-solarization-of-clinics>

39 Power For Health: India Action Plan, Powerforall.Org/Health

11. Conclusion and the Key recommendations

Decentralised Renewable Energy (DRE) solutions can play a vital role in the development of the health sector because they are well suited for diverse terrain and sparsely located habitat in Bihar and they can be customised in innovative ways. Thus, accelerated deployment of renewable energy to strengthen health care centres and recalibrate the public health infrastructure is the need of the hour.

- ❖ There must be a robust policy mechanism on Health and Energy integration and subsequent creation of an enabling atmosphere that takes into consideration prevailing issues, systematic gaps and priorities with the prism of the energy access for ensuring better health services to the people.
- ❖ National Health Policy-2017 aims to increase public spending ⁴⁰ up to 8% of GDP for State governments and this can be implemented at priority level since more funding on health sector will solve many riddles of procuring resources and it can help out in managing the finances for more infrastructure projects, technological up-gradation and sound human resource management in place.
- ❖ ‘Solarisation of Healthcare’ is much needed and a specific program should be launched to install distributed solar energy systems in all government owned public health care centres in all village, block, sub-division and district level to ensure primary and secondary healthcare services.
- ❖ To prevent maternal and child mortality from lack of vaccinations and institutional delivery facilities, a scheme “Solar for Mother & Child health” should be launched with a focus on solar cold chain for vaccine, solar powered labour rooms, solar powered ambulances along with necessary equipments under supervision of well-trained ANM and support staff.
- ❖ The MNRE led ‘Off-grid and Decentralised Solar PV Applications’ program should take due consideration of success stories witnessed in Chhattisgarh and speed up the deployment of renewable energy to power all non-electrified PHCs and sub-centres in Bihar.
- ❖ All public health centres must meet the criteria of Indian Public Health Standards, where road, communication and trained and skilled medical staff should be provided. Similarly, all PHCs and CHCs must be equipped with clean energy based medical devices, cold chain facilities, water heating and essential lighting services.
- ❖ There should be certain measures that contribute in aligning the goals of the NHM and the Energy department to meet shared objectives. Similarly, convergent roles of inter-aligned departments for overall health and human development should be ensured with a clear vision.
- ❖ Private financing and philanthropic grants from every possible means must be channelised for ensuring proper funding for energising the health sector. Promoting incentives and rewarding cooperation between the public private partnership for DRE is also desirable.
- ❖ The crisis of Covid-19 has compelled the government and policy makers to rethink the current state of health affairs and devote more resources for strengthening the public health facilities. Thus, the fresh push for a new policy and roadmap has been well positioned than ever before. This makes ample opportunity for the solarisation process of the health sector which will address the twin objectives of enhancing energy security to the health institutions and simultaneously increase access to health services to the people in dire needs.

⁴⁰ https://www.nhp.gov.in/nhpfiles/national_health_policy_2017.pdf



ABOUT CEED

Centre for Environment and Energy Development (CEED), an environment and energy expert group, is involved in creating sustainable solution 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 pathway, 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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