

# INTEGRATING ELECTRICITY PRIORITIES INTO HEALTHCARE AND EDUCATION IN INDIA: A REVIEW OF NATIONAL AND SUBNATIONAL POLICIES

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## EXECUTIVE SUMMARY

### Highlights

- Electricity plays a crucial role in achieving the United Nation’s Sustainable Development Goals (SDGs) on healthcare, education, and human well-being. Reliable electricity can help improve education and health services.
- Across India, especially in Assam, Jharkhand, and Rajasthan, electricity integration is indirectly connected to most social sector policies. The role of electricity in achieving health and education outcomes is widely recognized. However, few policies in these sectors integrate electrification, partly because of a lack of information, coordination mechanisms, and finance.
- Integrative policymaking and implementation require interdepartmental and administrative coordination. Policy frameworks and instruments in the electricity, health, and education sectors should include innovative coordination and financing mechanisms, mandate adherence, and allow for the necessary flexibility.

### Background

As the SDGs highlight, electricity is a key input in healthcare and education outcomes (Polansky and Laldjebaev 2021). Although the share of households in India with access to electricity rose from 44 percent in 2001 to 96 percent in 2020 (Agrawal et al. 2020), 37 percent

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*Working Papers contain preliminary research, analysis, findings, and recommendations. They are circulated to stimulate timely discussion and critical feedback and to influence ongoing debate on emerging issues. Most working papers are eventually published in another form and their content may be revised.*

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of schools and 24 percent of primary health facilities remained unelectrified in 2020 (NHM 2020). Data on the reliability of electricity connections are mostly absent, limiting a nuanced understanding of the connection between electricity and public service delivery. Improving the delivery of healthcare and education requires interdepartmental coordination, and policy is an important instrument to achieve integration. Hence, we need to understand how national and subnational policies discuss and focus on the role of electricity in achieving education- and health-related development outcomes.

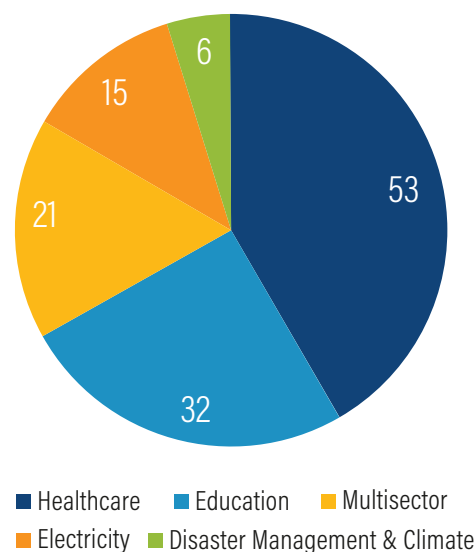
## About This Paper

This paper is part of WRI’s Energy for Development Initiative, which integrates clean energy into strategies for improving development outcomes across the Indian states of Assam, Jharkhand, and Rajasthan. It provides an overview of national and state healthcare, education, and multisectoral policies to show how they address integration across sectors and reports stakeholder suggestions on integrating the planning requirements of development sectors with electricity.

The report is based on a review of information that was publicly available on government websites. We reviewed 127 national and state policies on healthcare, education, electricity, disaster management, climate change, and development that focus on overall regional development (Figure ES 1 and Appendix A, Table A.1). Policies—schemes, programs, plans, vision documents, policy documents, and laws that provide legal backing to policies—were selected based on their mention of electricity or equipment that required electricity. We reviewed them to find linkages between electricity, healthcare, and education. We then categorized these linkages as indirect, basic, or integrative, based on the level of interaction and integration. Indirect policies do not mention electricity explicitly, even though it is required for implementation; basic policies acknowledge the role of electricity; and integrative policies reveal an understanding of the role of electricity in service delivery. Interviews were conducted with national- and state-level stakeholders to verify the findings and to solicit suggestions on policy changes.

The aim of the study is not to evaluate or compare policies but to use an analytical framework to understand levels of policy integration to strengthen linkages between electricity and service delivery. It uses the levers of policy action developed by Mogelgaard et al. (2018) to identify the instruments needed to bridge the implementation gap.

Figure ES 1 | Sectoral Distribution of Policies Reviewed



Source: Authors

## Key Findings

- The policies reviewed are not always independently integrative, but in some cases, multiple policies work together to support integrative outcomes. For example, Assam’s Energy Vision document delineates the relationship between electricity and health and education outcomes; its Solar Energy Policy 2017 operationalizes the vision via an action plan.
- Some policy documents mention electricity but do not provide for it or link to other policies to support its operationalization. According to the stakeholders interviewed, this implementation gap persists because of the lack of department mandates, interdepartmental coordination, and financial flexibility.
- Accountability does not always flow in the same direction as the influence to roll out policies or funds. Some health and education policies that aim to improve service delivery require access to electricity as a prerequisite for eligibility for a scheme, putting the onus on the healthcare or education facilities rather than on government departments to ensure that reliable electricity is available. This practice results in a vicious circle in which facilities already deprived of electricity continue to be excluded from other assistance. A mechanism to allow them to procure reliable electricity is missing.
- Accessibility, organization, and governance of datasets corresponding to policies reflect the intent of the agency to influence how data can inform decision-making. Integrative and interdepartmental datasets possess greater scope for convergence in

comparison with siloed information. It is challenging to reconcile healthcare data with other development indicators because the administrative units for healthcare and revenue are different. NITI Aayog’s Champions of Change dashboard and WRI’s Energy Access Explorer platform are gathering interdepartmental indicators to support informed decisions.

## Recommendations

- Policies must link electricity with development outcomes based on local information. Flexibility should be embedded in funds (such as untied funds) to provide local decision-makers with some agency in mitigating policy implementation barriers.
- Providing reliable electricity for health centers and schools should be the responsibility of centralized decision-making entities at the state or national level. Individual facilities should not be burdened with provisioning to qualify for policies or programs.
- Effective policy frameworks include strong accountability and enforcement mechanisms, such as policy monitoring systems. Monitoring currently focuses

on physical progress and financial spending indicators. It does not evaluate the impact of building assets on overall development and well-being. Such evidence is significant for the development and implementation of integrative policies.

- As integrative policies are useful but insufficient to achieve intended outcomes, for policies to be transformative, instruments that operationalize policies—such as institutional structures, finance, and information and coordination mechanisms—must be in place.

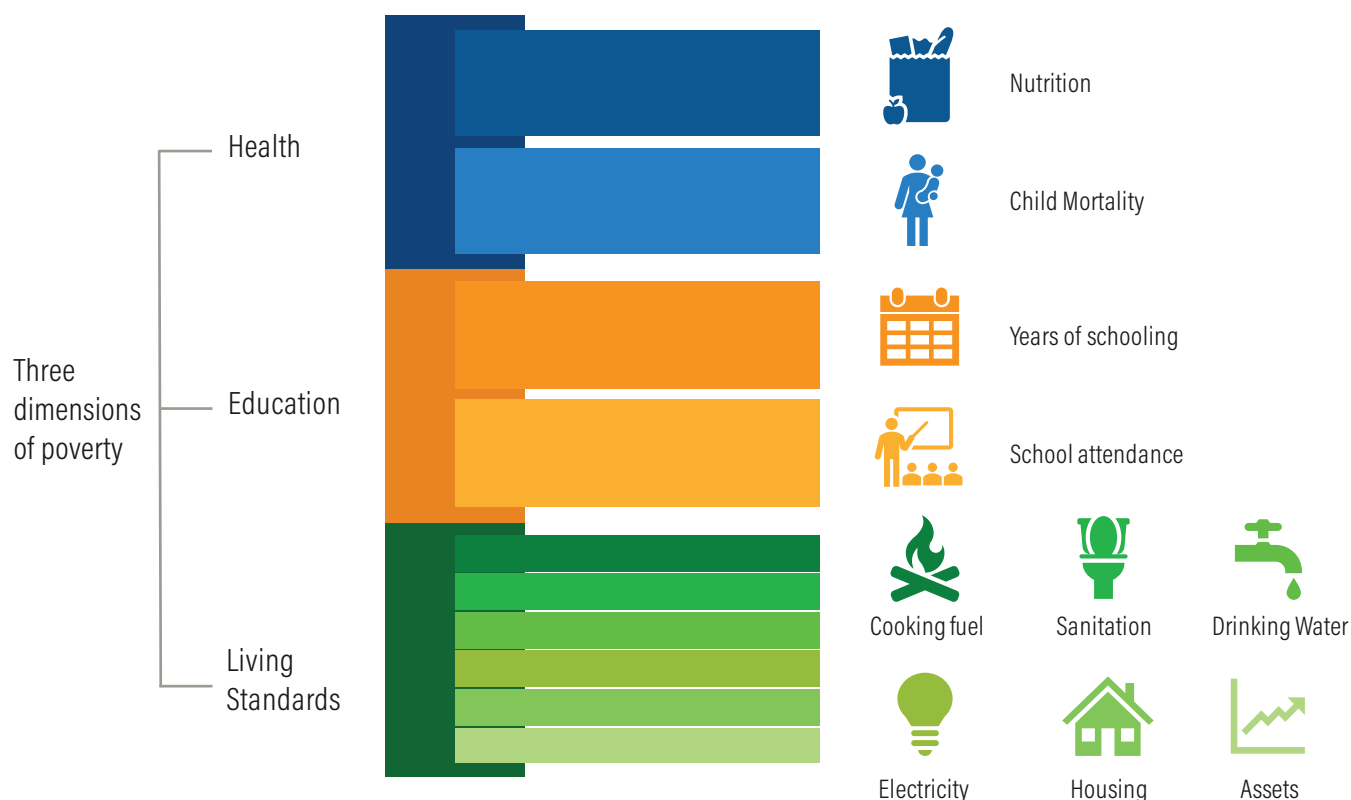
**Note:** The numbering system followed in this working paper is the Indian numbering system. Typical values that are used are lakhs (1 lakh = 100,000) and crores (1 crore = 10 million)

## 1. INTRODUCTION

### Reliable Electricity and Sustainable Development

Poverty involves multiple deprivations. The Multidimensional Poverty Index comprises 10 indicators in health, education, and living standards to identify who is poor and in what ways. People are considered poor if

Figure 1 | The Multidimensional Poverty Index



*Note:* Persons are MPI poor if they are deprived in 1/3 or more of these weighted indicators, where health and education indicators are weighted at 1/6 and living standards indicators at 1/18. *Source:* Recreated from UNDP & OPHDI 2019.

they are deprived in one-third of the weighted indicators shown in Figure 1 (OPHDI 2018). Health and education form two-thirds of these indicators.

The SDGs recognize that strategies to alleviate poverty and inequality must align with actions to enhance healthcare, education, and socioeconomic development. The *Status of Electricity Access Report*, which examined the role of energy in achieving the SDGs, observed its interconnectedness with 125 of the 169 SDG targets (World Bank 2017).

Electricity is necessary but insufficient to deliver services such as health and education. Electrification does not demonstrate a linear relationship with outcomes in these sectors, which are also influenced by “structural, institutional, and power dynamics” of the contexts in which they are implemented (Polansky and Laldjebaev 2021). Linkages between energy and other development sectors are most evident to local governments, which can observe the role electricity plays in providing required services, and to local energy service providers, whose businesses depend on demand from productive users (Odarno 2020).

Although India is close to achieving electricity access for all, its emphasis is on coverage rather than on reliability (World Bank 2018). In addition, electrification policies tend to focus on household electrification, with little or no emphasis on electrification of institutions such as schools and clinics. Although household electrification soared over the last decade, it did not improve overall electricity access for development services in Assam, Jharkhand, and Rajasthan (Wood 2020), the three states examined in this report. Reliable electricity can be an enabler in achieving service delivery objectives. Improving electricity is particularly critical at a time when the response to the COVID-19 pandemic must rely on 24/7 reliable electricity to power medical systems and devices.

## The Importance of Electricity in the Health and Education Sectors

India’s Ministry of Health and Family Welfare (MoHFW) focuses on reducing maternal mortality and infant mortality rates by targeting improvement in access to 24/7 health services for childbirth, neonatal and pediatric care, and timely vaccinations. These services depend on the availability of electricity, which is needed to operate and sterilize medical equipment, refrigerate vaccines, incinerate and treat medical waste, improve patient access and staff retention, reduce absenteeism, and make working conditions at facilities

safer (WHO and World Bank 2015; Ramji et al. 2017). Electricity access can also enable remote health facilities to connect with specialists via telemedicine initiatives. Jyotigram Yojana, launched by the Gujarat government in 2003, rationed electricity supply for agriculture to provide 24/7 supply for other rural users, including schools and primary health centers (PHCs).<sup>i</sup> It improved the functioning of medical equipment, child immunization and maternal health services, and the reach of information and communications technology (ICT) (Chen et al. 2019).<sup>ii</sup> Studies by Koroglu et al. (2019) in Maharashtra and Bhattacharyya et al. (2016) in Jharkhand observe that the frequency of electricity outages in health facilities influences patients’ preferences for accessing them for maternal health services.

Electricity can improve access to lighting and cooling, water and sanitation, and digital resources, all of which are likely to increase school attendance. India’s *Economic Survey 2019–20* shows that states with high school electrification rates have higher literacy rates. In conjunction with water, sanitation, and hygiene (WASH) facilities, access to electricity creates a comfortable environment for students and teachers. Electricity also increases access to ICT, improves the quality of education, and helps retain teachers. Lack of suitable WASH facilities such as clean toilets for menstrual hygiene contributes to increased female dropout rates; electricity for pumping water can help improve WASH facilities (GEA 2012; SEforAll 2018; UNDESA 2014). In a study of households in India and Nepal, more than 80 percent of respondents perceived that electricity access improved school enrollment rates (Rao et al. 2016). Electricity also enables children to study after dark and improves air circulation in poorly ventilated school buildings (Goodwin 2013; Kirubi et al. 2008; Valerio 2014).

The pandemic has highlighted the need for enhanced institutional coordination and integration to allocate and reallocate resources promptly (Rajan et al. 2020; The Hindu 2020). It provides an opportunity to promote integrative policies.

## About This Paper

WRI’s Energy for Development Initiative applies a four-pronged scaling strategy that involves accessing better data to identify poorly served demand, right-sizing electricity supply systems to respond to the demand, designing sustainable financing instruments, and mainstreaming evidence to achieve outcomes. This paper is part of the initiative, which integrates clean energy into strategies for improving development outcomes across

Table 1 | Key Findings of the Literature Review

INDICATOR	ASSAM	JHARKHAND	RAJASTHAN	INDIA	SOURCE
Per capita net state domestic product at current prices (2011–12 series), INR (2017–18)	74,204	69,265	99,487	1,14,958	MoF 2019
Electricity consumption per capita, kWh (2019–20)	348	853	1,317	1,208	MoP 2021
Literacy rate (percent, 2011)	73.2	67.6	67.1	73	Gol 2011
Change in enrollment between 2014/15 and 2015/16	-421,225	-18,721	313,933	-950,398	NIEPA 2016a, 2016b
Percentage of all schools with electricity (2016)	19.5	15.1	55.3	57.3	NIEPA 2016b
Percentage of government schools with electricity (2016)	99.68	92.71	97.56	95.12	MoE 2019
Percentage of functional schools that are unelectrified (2017–18)	75.1	46.6	35.1	33.37	NIEPA 2020
Life expectancy (years, 2014–18)	66.9	69.1	68.7	69.4	Gol 2020
Infant mortality rate (infant deaths per 1,000 live births, 2016–18)	43.1	29.4	38.9	33.1	Gol 2018
Maternal mortality ratio (maternal deaths per 100,000 live births, 2015–17)	229	76	186	122	Gol 2019a
Percentage of functional health subcenters that are unelectrified (March 2019)	62.3	65.7	35.2	26.3	MoHFW 2019
Percentage of functional primary health centers (PHCs) that are unelectrified (March 2019)	6.7	55.2	4.3	4.8	MoHFW 2019

Note: The objective is not to show a correlation but to provide a profile of crucial development and electricity characteristics across the three states.

Gol = Government of India; MoE = Ministry of Education; MoF = Ministry of Finance; MoHFW = Ministry of Health and Family Welfare; MoP = Ministry of Power; NIEPA = National Institute of Educational Planning and Administration.

the Indian states of Assam, Jharkhand, and Rajasthan. Table 1 presents development indicators on the three states as a reference for policy review and analysis.

As demonstrated in other contexts, suitable policies are necessary to align healthcare and electricity priorities (Porcaro et al. 2007) (Box 1); integrate energy with other development policies, such as health (Yan 2015); and ensure policy coherence, to achieve equitable outcomes (Franklin et al. 2019). In Assam, Jharkhand, and Rajasthan, however, policies, programs, plans, schemes, guidelines (hereafter referred to as “policies”), or instruments of administrative decision-making and imple-

mentation in sectors such as healthcare and education do not explicitly consider electricity.

At the policy design level, the development and electricity sectors work in silos. The lack of policy linkages and coordination between departments makes it difficult to electrify unserved and underserved areas. How can development sector policies be designed to facilitate better coordination between policies on health, education, and electricity? How can electricity policies be designed so that they reflect the development sector’s requirements?

## Box 1 | Increasing Access to Energy in Rural Uganda by Integrating Policies across Sectors

Uganda's Energy for Rural Transformation (ERT) program aimed to increase access to energy in rural Uganda by seeking rural transformation, rather than focusing on the energy sector alone. It included households, public institutions, and rural enterprises. The education, sports, and health ministries were involved in decision-making, led by the Ministry of Energy and Mineral Development. The program led to the electrification of 546 schools (including 60 computer labs) and 522 health centers, exceeding its target. Project design shortcomings adversely affected the achievement of other project objectives, such as household electrification and ICT access. The integrative approach by ministries was limited to this donor-driven project; it did not set a precedent for integrating policies across national development programs.

Source: IEG Review Team 2017.

## What Is an “Integrative” Policy?

Governments stimulate, direct, and regulate development and improve human well-being through national and state policies. Hallsworth and Rutter (2011) note that the fundamentals of effective policy include clarity of goals, open and evidence-based idea generation, rigorous policy design, responsive external engagement, thorough appraisal, clarity in the role of the government and accountabilities, and establishment of effective mechanisms for feedback and evaluation. Policymaking is often considered a linear process that starts with problem identification, policy development, implementation, and evaluation. In practice, it is more complicated. As the government is continuously trying to balance citizens' needs and expectations with the need to be responsive to changing circumstances, many of these activities must be carried out simultaneously (European Union 2017).

Concepts such as superimposition (Bhardwaj and Khosla 2020) and mainstreaming (Mogelgaard et al. 2018) seek to address the governance challenges of achieving shared outcomes. Superimposition is a tactic used by local governments to address shorter-term, incremental efforts at coordination to achieve multisectoral outcomes such as local climate action. Mainstreaming adaptation to climate change in development has lessons for integrating electricity across development sectors. Mogelgaard finds that failure to incorporate adaptation into development initiatives and policies reflects the lack of sustained political support, clear mandates, coordination mechanisms and finance, and poor access to information. Integrative policies, supportive coordination, and financial mechanisms that

sustain leadership and political support and provide access to information and tools for decision-makers can narrow the gap. These measures form the basis of the analytical framework used to review the policy documents in this paper.

Integrative policymaking processes are critical to ensure flexibility and the ability to adapt to changing circumstances. They include horizontal integration (integration across line ministries, departments, or sectors) and vertical integration (integration across district, state, and national administrations). Integrative policymaking allows policymakers to allocate budgets effectively, address accountability deficits, and build on innovative initiatives (Pew-MacArthur Results First Initiative 2014).

Effective policies are action-oriented, relevant, unambiguous, and flexible enough to respond to the dynamics of the policy landscape. Evidence-based policymaking requires high-quality data, analytical capacity, and policy incentives (Head 2020). The main challenge in India is the lack of high-quality data (Kattumuri 2015).

India's Integrated Child Development Scheme<sup>iii</sup> (ICDS) is an example of how poor coordination and integration of resources can derail a well-intended and designed policy. The ICDS was launched in 1975 to reduce infant/child and maternal mortality rates and improve overall maternal and child health. The scheme is run by the Ministry of Women and Child Development (MoWCD) at the national level and by the Health Department at the state level; 13.7 lakh *anganwadi* (rural childcare center) centers (GoI 2019c) and 26.8 lakh workers and helpers (GoI 2019b) work together to operationalize the scheme. The program served about 8 crore children and 1.9 crore pregnant and lactating women until 2015 (Chakrabarti et al. 2019). However, lack of an effective coordination mechanism, diversion of funds, suboptimal coverage, varying service provision, and lack of quality monitoring meant that the program did not perform as expected to reduce malnutrition (Balarajan and Reich 2016). The program's limitations highlight the importance of integrative policy.

## 2. METHODOLOGY

The data analyzed included documents officially titled as policies, schemes, programs, plans, laws that provide legal backing to policies, rules, regulations and guidelines in the healthcare, education, electricity, social development, revenue and planning sectors at the national level and their corresponding subnational directives and policies in Assam, Jharkhand, and

Table 2 | Description of Data Used in the Study

CATEGORY	DESCRIPTION
Sectors	Healthcare; primary and secondary education; disaster management and climate; and multisector (including social development, revenue, and planning as well as rural development policies that aim to improve infrastructure). Electricity and energy policies were also included, to determine whether they acknowledged demand-side requirements
Types of document (as categorized officially)	Policies, schemes, programs, briefs, missions, plans, acts, rules, regulations, guidelines, and standards
Year	When the policy was issued and/or was first implemented
Status	Draft or operational
Jurisdictions	National or state (with corresponding national ministry and nodal agency responsible for achieving the policy objectives)
Responsibility	Nature of work undertaken by the nodal agency that developed the document (policy design, budget planning, implementation)
Electricity linkages (for non-electricity policies)	Electricity supply, infrastructure development, input for policy outcomes

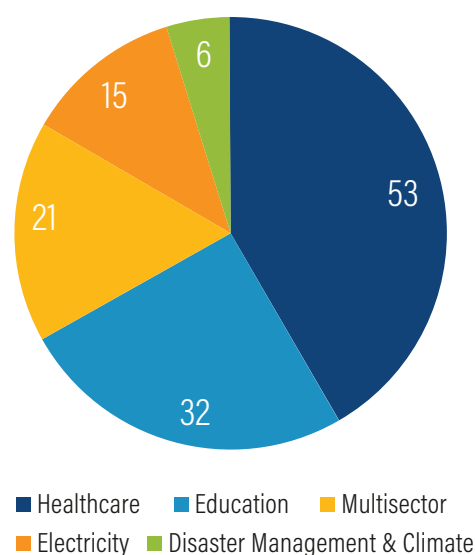
Source: Authors.

Rajasthan. The research team first identified a list of national and subnational policies with an explicit need for electricity (immunization policies need cold storage, for example). It then collected 183 policies based on the authors’ field experiences of interacting with these policies, by scanning the Web pages of ministries and departments and conducting stakeholder consultations. Policies before 2014 (when electrification efforts scaled up in India) were excluded from the review unless they continued to be operational. Table 2 describes the data collected.

About half of the policies identified were in healthcare, and a third were in education (Figure 2).

Mogelgaard et al. (2018) provided the analytical framework for this study. Their levers of effective policy implementation critical to integrating non-traditional dimensions (reliable electricity access, in this context) to development objectives were used to understand the broad categories of policy design and the ingredients necessary to make them integrative and transformative.

Figure 2 | Sectoral Distribution of Policies Reviewed



Source: Authors

Four levers were studied:

- **Policy frameworks** are crucial in demonstrating formalized intent regarding policy objectives. The conditions mandated by them, as well as flexibility provisions, provide the opportunity to incorporate electricity-related components in the framework.
- **Coordination mechanisms** are necessary to operationalize interdepartmental and transdisciplinary requirements on incorporating varying levels of electricity provisioning in healthcare and education.
- **Financial processes** support the vision of frameworks and the mechanisms of coordination through explicit budgets and fund allocations. Finance and planning departments play pivotal roles in ensuring coordination across other departments.
- **Information and tools** enhance cross-sectoral capacity and evidence to inform policymaking.

Semi-structured stakeholder consultations were conducted to solicit comments on policy implementation, corroborate our findings, and give stakeholders the opportunity to offer recommendations. Stakeholders included non-administrative staff who support the development efforts of states and districts, a former state electricity regulatory commissioner, a public engineer involved in the solarization of PHCs and schools, a doctor who is solarizing a charitable hospital situated in a remote area, members of an international NGO that works closely with the government on education priorities, and a member of an educational grassroots organization. The expert consultations included the government, a think tank, and not-for-profit implementation organizations at the national, state, and district levels. A diverse group of stakeholders were contacted, but only a small number responded to requests to be interviewed. The stakeholder interviews were conducted primarily to corroborate findings from the desk review of policies. Resource constraints and protocols initiated because of COVID-19 limited access to a wider range of stakeholders whose inputs would have provided additional perspectives. Despite these limitations, the preliminary findings provide a foundation for further inquiry.

### 3. ANALYSIS

Linkages between electricity and development outcomes are explicit only in limited instances. In most cases, they are an afterthought or absent.

Policies were grouped into three categories:

- **Indirect:** The policy needs electricity to be implemented, but makes no mention of it.

- **Basic:** The policy acknowledges the role of electricity.
- **Integrative:** The policy reveals a more nuanced understanding of the relationship between electricity and public service delivery and integrates electricity with users' demand.

Of the 127 policies reviewed, 9 did not mention electricity at all, despite having an explicit need for it; 50 fell into the indirect category; 59 fell into the basic category; and 11 fell into the integrative category. Most of the integrative policies are national, but Jharkhand and Rajasthan each had two such policies.

Indirect policies specify the processes, systems, and equipment required for implementation of policy objectives, but do not mention access to reliable electricity for operationalizing them. Most policies we looked at fall into this category.

Stakeholders confirm that central and state policies do not consult ground-level health workers, teachers, *anganwadi* workers, or even *panchayats* (village council). As a development sector stakeholder from Jharkhand noted: "If they did, they would realize that electricity, water and sanitation don't just spontaneously materialize; they need to be planned for."

#### Health

All state health policies in India aim to improve maternal and child health. They include programs for improving infrastructure to support the policy goals. Infrastructure includes building new facilities such as PHCs, community health centers (CHCs),<sup>iv</sup> and health and wellness centers (H&WCs)<sup>v</sup> and upgrading existing ones; purchasing new equipment; and improving diagnostic and monitoring services. None of these improvements specifically mentions access to reliable electricity or electricity charges, an additional dimension that needs to be reflected in the planning and budgeting of a department to ensure uninterrupted electricity. Department budgets normally plan for civil infrastructure, but they do not include items that support infrastructure, such as electricity:

- The 2006 national Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA) emphasizes the need for appropriate infrastructure.<sup>vi</sup> Its operational framework details the selection criteria for a health facility to access PMSMA benefits and lists every piece of equipment and diagnostic service a health facility is required to have. However, it does not mention electricity.



- The success of the Universal Immunisation Programme, which aims to provide universal coverage of life-saving vaccines to infants, children, and pregnant women, depends on the ability to store and transport vaccines at specified temperatures and therefore assumes refrigeration or cold chain infrastructure. But this program does not mention access to reliable electricity either.
- Under the National Health Mission (NHM), Jharkhand's Mobile Medical Unit Scheme (MMUS) seeks to improve healthcare services in remote areas through vans that function as mobile health facilities and supplement brick-and-mortar health facilities in unserved, underserved, and hard-to-reach areas. These units require decentralized electricity systems and battery storage to power basic laboratory equipment, vaccine boxes, and television monitors, which are used to conduct basic examinations in remote areas (SELCO Foundation 2018). The scheme guidelines remain silent on how the mobile medical units access electricity. Currently, units run primarily on a public-private partnership (PPP) model (for example, a unit in Namkum, Ranchi District, which is operated in collaboration with the Airport Authority of India). This project provisions for access to solar-powered electricity.
- Assam's Health Department uses a PPP model to fund charitable hospitals, which provide free or low-cost health services. Funding can be used to upgrade infrastructure—but upgrading is defined only as procuring equipment. It is unclear whether the fund can be used to procure an electricity connection, as the fund clearly states that operational charges are ineligible for coverage, as are recurring electricity charges. Although recurring charges may not be covered by the scheme, there needs to be an entity that is mentioned and held accountable for ensuring finance for electricity bills. A charitable hospital organization that accessed funds available through the PPP model does not always materialize, and to access the fund, hospitals must fill out a fund utilization form annually. The utilization parameters change every year, making it difficult for the hospital to indicate whether it used the fund to invest in improving electricity infrastructure.
- Rajasthan's Health Department has created eight online monitoring systems to improve healthcare delivery (MoHFW 2021). These systems are used to manage the supply chain of equipment, ambulances, medicines, diagnostic services, and human resources. They also support disease surveillance, telemedicine services, and mortality reporting. Such

portals are supposed to be accessible to all health facilities for regular updates, which requires digital infrastructure that runs on electricity. As the online portals do not discuss improvement in supporting infrastructure, it is difficult to ascertain how health facilities in regions with poor electricity access use these portals. NGOs working with health centers in Rajasthan underscore the need to engage with health workers while developing monitoring protocols that require access to online portals. Many health centers do not have access to computers, the Internet, or electricity. Health workers are sometimes asked to use personal devices, but most workers in Rajasthan do not own smartphones.

On a national scale, the National Digital Health Mission, which arose from the National Health Policy of 2017, aims to digitize all healthcare in India. The National Digital Health Blueprint, which provides a five-year action plan for the implementation of this mission, does not discuss the role of electricity. State-level stakeholders mention that the mission's aim—and initiatives such as the Electronic Health Record and National Health Stack introduced by NITI Aayog in 2018—to digitize health and insurance records are unrealistic. Health centers lack access to reliable electricity or computers and are unable to digitize paper records. Many patients are illiterate or cannot comprehend the informed consent needed before a healthcare provider can access data such as health history, marriage history, caste, and address. If digitization and online portals are made mandatory, many patients may lose access to health service, increasing the inequities in society. These digital initiatives fall short because of the absence of policy frameworks and coordination mechanisms pertaining to reliable electricity access.

## Education

The National Right to Education Act 2009 and the subsequent state-level regulations for Assam, Jharkhand, and Rajasthan focus on basic infrastructure requirements for schools. They mandate that schools must have drinking water and sanitation facilities, but do not always recognize the need for electricity. States' operational guidelines mention electricity as part of the civil works component, but they do not discuss the means of accessing electricity (grid connection, relevant approvals); the reliability of the source; or recurring expenses:

- Under the umbrella of the Sarva Shiksha Abhiyan (SSA),<sup>vii</sup> Jharkhand's Model School Scheme (MSS) aims to build quality senior secondary schools in every block (district subdivision) of the state.<sup>viii</sup> The program broadly mentions that good infrastructure

in schools is an objective. However, it does not discuss what constitutes infrastructure.

- Digital literacy programs—such as Digital Infrastructure for Knowledge Sharing (DIKSHA)<sup>ix</sup> and the E-Sakhi Yojna of Rajasthan,<sup>x</sup> which trains women to access various government benefits—require access to computers and smartphones, but the programs rarely explicitly mention electricity. The gap does not necessarily mean that schools do not have access to electricity. It highlights the fact that electricity may not be a priority and that accessing electricity might be complicated. Identifying electricity as a critical infrastructure requirement in schools could lead to better education outcomes (Box 2).

### Box 2 | Improving Education Outcomes in Brazil by Providing Electricity

To electrify rural public schools, Brazil created the Light for All in Schools program. The program also includes rural households below the poverty line, urban households without basic living infrastructure, *quilombos* (Brazilian hinterland settlements), and indigenous and other small communities. Schools that received electricity through the program before 2013 saw dropout rates fall by 16% over three years; schools electrified between 2013 and 2016 saw the rate fall by 27% in three years.

Source: Mejdalani et al. 2018

### Multisector

The absence of explicit planning for electricity is also evident in multisector policies:

- The National Shyama Prasad Mukherji Rurban Mission (SPMRM) prioritizes water supply, sanitation, road infrastructure, health clinics, and education. Although the program aims to provide 24/7 water supply, add streetlights in villages, and improve the coverage of digital education, it is silent on the electricity required to power these services.
- The Multisectoral Development Programme (MsDP) aims to improve the socioeconomic conditions of minority groups by enhancing infrastructure for education, skill development, health, sanitation, *pucca* (permanent dwelling) housing, roads, drinking water, and livelihoods. An assessment of the program noted that it had a significant impact on education and health by reducing deficits arising

from the lack of classrooms, vocational centers, residential schools, and diagnostic centers (IIPA 2017). The construction and upgrading of schools, the procurement of computers, lab equipment, and drinking water facilities in the schools, and the development of health facilities and *anganwadis* indicate that electricity indirectly played a role in improving access to education and healthcare. However, electricity infrastructure was not mentioned even in the impact assessment.

According to stakeholders in all three states, most health policies would fall under the indirect category. These policies do not discuss electricity provisioning, and even if they do (as in the case of the Indian Public Health Standards [IPHS] guidelines), implementation remains a challenge. Stakeholders note that in crafting central and state policies, policymakers do not consult ground-level health workers, teachers, *anganwadi* workers, or even *panchayats*.

### Basic Policies

Basic policies consider electricity a supply-side requirement and provide directions on determinants of the quality of electricity supply, the potential sources that can be accessed, and institutional instruments that can be used to ensure the operationalization of a service. They often also allude to electricity as a requirement for regular operations while stopping short of connecting the availability of electricity to improved education, health, hygiene, or other indicators.

### Health

Examples of basic policies are common:

- The Clinical Establishment Act, 2010 lists electricity supply as a requirement for every health clinic in India. Certification of the clinic is provided only if a source of electricity is confirmed. However, the act does not qualify the type of connection or specify the quality of the electricity supply. The Chief Minister's Free Diagnostic Services Programme<sup>xi</sup> in Assam and the Kushal Mangal Karyakram (KMK)<sup>xii</sup> in Rajasthan require electricity in health facilities as an essential eligibility criterion. The onus should not be on health facilities to secure electricity; however, healthcare workers from unelectrified centers are forced to liaise with authorities to get electricity connections. As of October 2015, KMK had organized 7,741 camps, benefiting over 200,000 people (Mukul 2018). This number could be increased if more health facilities had access to electricity, making them eligible for hosting such camps.

- The *Maternal and Newborn Health Toolkit* created by the MoHFW lays out standard designs and protocols for setting up maternal and newborn facilities at different public health centers.<sup>xiii</sup> A requirement is 24/7 electricity with backup resources.
- The *Immunization Handbook for Health Workers* details the electricity requirement for ice-lined refrigerators and provides guidelines on optimal use (MoHFW 2018). However, there is no discussion of the source of electricity or how and where health workers can reliably access it across the immunization chain.
- State NHM budgets include electricity under operating expenses, but they fail to discuss provision of electricity connections to health facilities that do not have one. They also fail to indicate whether operating expenses include grid electricity charges or diesel fuel use. Rajasthan's 2020–21 NHM budget indicates that funding will not be made available for new health center construction unless IPHS guidelines are followed, thereby ensuring that electricity-related facility requirements are considered. However, the state-level stakeholders we interviewed noted that the IPHS is considered an aspirational document. Scarcity of resources and limited capacity in rural areas makes operationalizing the IPHS guidelines challenging. They note that initiatives such as Kayakalp by MoHFW, which provides incentives such as certifications that result in expanded funding opportunities, are considered more beneficial. Currently, approvals of health centers are based on state department standards, which are not in conformance with the IPHS. A stakeholder from Rajasthan noted that the NHM budget approves most health centers even if they do not follow IPHS guidelines.
- CHCs are given diesel generators (per IPHS guidelines<sup>xiv</sup>). Facilities' electricity bills are covered through a contingency fund allocated for sundry expenses (CHCs can receive INR 1 lakh, and subcenters and H&WCs get INR 10,000 a year).<sup>xv</sup> Although the H&WCs receive funds to upgrade their buildings, under the Ayushman Bharath Programme, the checklist for upgradation does not include electricity. As one stakeholder involved in district-level implementation observed, a civil engineer is responsible for determining how the infrastructure upgrading funds can be deployed, but electricity is not considered at the design stage.
- In Jharkhand, antenatal care (ANC) is a priority for the Rural Health Mission and the Transformation of Aspirational Districts Programme (TADP)

district implementation teams. MoHFW's Surakshit Matritva Aashwasan (SUMAN) program provides antenatal medical checkups and diagnostics. In 2020, auxiliary nurse midwives who could not travel to remote areas because of the COVID-19 pandemic and subsequent lockdown used telemedicine. The results were mixed, because it relied on electricity and Internet coverage, a challenge in rural and remote areas.

In Jharkhand, some districts have come up with ways to allocate separate funds for electricity provisioning and upgrading, with the objective of ensuring 24/7 electricity supply. Financial allocation and policy frameworks need to coordinate with and be informed by line departments to understand local issues and improve the implementation of services.

## Education

Examples of basic policies in the education sector include the following:

- The National Ekalavya Model Residential Schools (EMRS)<sup>xvi</sup> program and Rajasthan's Chatrawas Scheme<sup>xvii</sup> aim to improve literacy rates in socially and economically backward regions. They cite electricity as a requirement for schools and hostels (on-campus student housing). Although the revised EMRS guideline does not explicitly mention electricity, the Expression of Interests for construction of a school requires that electricity supply, installation, testing, and commissioning of substation equipment, diesel generators, uninterrupted power supply units, and external electrical work be included in project cost estimates (NESTS 2020).
- Ekalavya schools in Assam are encouraged to use energy-saving measures and renewable energy options at the construction stage. However, we were unable to ascertain whether the schools have access to reliable electricity. In Assam, the Gunotsav Evaluation Guidelines are meant to evaluate whether schools have the infrastructure needed for a suitable teaching environment. One of the indicators for this evaluation is the availability of electricity (internal wiring and connection to a source). The guidelines stop short of measuring reliability and related operational expenses. At the national level, the Unified District Information System for Education (UDISE) dashboard provides a similar database, without collecting information on reliability.
- The national Atal Tinkering Lab (ATL) initiative of the SSA is implemented by the Jharkhand Education Project Council (JEPC).<sup>xviii</sup> It mandates that

a school must have an electricity connection to be eligible to establish a lab. A stakeholder from Jharkhand noted that making electricity a prerequisite has sometimes resulted in a perverse outcome. More central and accessible locations that already possess the requisite school infrastructure end up being selected. Under the ATL, finance is provided for procuring equipment and its maintenance; the program does not lay down guidelines as to how a school obtains an electricity connection.

In Jharkhand, 38 percent of government schools operating under ATL have an electricity connection. Schools fund their electricity bills through an annual maintenance fund obtained from the school management committee, covering up to INR 1 lakh (the amount is proportional to the number of students enrolled).

Smart classes and ICT labs in remote areas suffer from the poor quality of electricity supply. The policy assumes that schools have reliable electricity because they have an electricity connection. Unless electricity infrastructure is included in the budgetary requirement of the education department, the reliability and sustainability of the electricity system may be challenging to ascertain in the policy review.

- The national SSA, operationalized by all state governments, allocates part of its budgets to infrastructure development. It lists civil works, which include electrical wiring and connections. The Draft National SSA document discusses electrification and the use of renewable energy solutions. It has the potential to be an integrative policy, as it recognizes that “development of school infrastructure is a holistic exercise of developing the school building along with its indoor and outdoor spaces to promote universal access, retention, equity and quality in education.”

## Energy

Basic policies in the energy sector include the following:

- The Saubhagya Program, which aims to electrify households in remote regions, also covers public institutions, including schools, *panchayat* offices, health facilities, and community centers.<sup>xix</sup> However, even for households, revised definitions of which households classify for electrification meant that nearly 15 million households were left out, as they were either unaccounted for, did not apply for an electricity connection, or were unwilling to pay electricity bills (Urpelainen 2019). Even connected

households faced challenges with intermittent power supply and voltage fluctuations (Smart Power India 2019). Assam’s Solar Energy Policy, 2017 is supposed to operationalize its Energy Vision, which aims to align electricity access and development outcomes.<sup>xx</sup> Establishing smart microgrids for critical health facilities is one such objective. However, the policy action plan is supply driven and does not reflect the demand characteristics of these government institutions.

- Jharkhand has some of the most diverse and detailed policies pertaining to electricity. Its Power for All program and Solar Power Policy of 2015 discuss rural electrification and the use of decentralized renewables to ensure reliable supply. There is no mention of institutional loads of healthcare, education, or livelihoods, or the demand-side characteristics of electrification. The state has released a Draft Power Policy of 208 and a Draft Mini Grid Policy that will complement the Power for All program.
- The Rajasthan Solar Energy Policy notes that government schools and hospitals can access incentives to deploy on-grid solar systems. It restricts access to facilities in remote areas, which may have a poor or no connection to the grid and might benefit from off-grid or hybrid solutions. For powering the drinking water supply schemes of the Public Health Engineering Department (PHED) in remote regions, the policy provides funds for off-grid solarization. Health sector NGOs have observed increased uptake of solar for electricity in health centers. Their sustainability depends on the operation and maintenance of solar photovoltaic (PV) systems in remote regions (Box 3).

## Multisector

Examples of multisector basic policies include the following:

- National programs such as the Member of Legislative Assembly’s Area Development Scheme (MLA-ADS),<sup>xxi</sup> the Members of Parliament Area Development Scheme (MPLADS), the Backward Regions Grant Fund (BRGF),<sup>xxii</sup> the Pradhan Mantri Jan Vikas Karyakram (PMJVK),<sup>xxiii</sup> and the Gram Panchayat Fund and the Special Central Assistance–Tribal Sub Plan (SCA–TSP)<sup>xxiv</sup> allocate funds to underdeveloped regions with a focus on infrastructure development. The MLA-ADS and BRGF specifically fund school electrification. The PMJVK focuses on digital education-related infrastructure development and energy efficiency. The SCA–TSP allocates

### Box 3 | Redesigning the Sustainable Solar Market Package to Reflect Operations and Maintenance Requirements

The Sustainable Solar Market Package (SSMP) is an ongoing program by the World Bank that promotes off-grid solar to public facilities and households in various countries. It is a contracting mechanism that provides supply, installation, and maintenance of solar PV systems to clinics, schools, and other public facilities bundled with commercial sales of solar home systems (SHSs) to households.

Vendors are responsible for operations and maintenance (O&M) for the first five years. The remoteness of the installations and lack of government enforcement of O&M and quality standards of installation adversely affected results (SEforAll 2019). The major concerns were after-sales service and the availability of spare parts. Granting the contract for off-grid (public facilities) and SHSs to a single vendor turned out to have been a mistake, as it did not ensure that the best contractor was selected, given the different skillsets required for each.

Suggestions for redesigning SSMP included the following (Hankins 2017):

- Add result-based financing to the SHS component, adapted to the needs of each district.
- Design a minigrid solution to incorporate schools, clinics, and clusters of buildings instead of stand-alone systems, supplying institutional buildings as anchor loads.
- Change service contracts to adopt a service-oriented approach for electricity delivery rather than a procurement approach limited to equipment.
- Create local capacity building to support training centers for local technicians and O&M staff.

Source: IFC 2007

funds for building solar energy infrastructure for residential schools. These schemes also fund the development of health infrastructure, but they do not link electricity to health facilities in the way they do with schools.

- The Northeast Special Infrastructure Development Scheme (NESIDS) aims to improve rural infrastructure in the northeastern states of India. It mentions the improvement of electricity but does not specify whether access will be made available to schools and health facilities. Activities carried out under this scheme in Dhubri (Dhubri 2019a) and Hailakandi (Hailakandi District 2019) districts from 2016-17 to 2017-18 in Assam show no projects related to electrification. Similarly, activities completed under the

MPLADS in Dhubri district (Dhubri 2019a, 2019b) from 2014-15 to 2018-19 include hospital construction activities, but do not specify whether these hospitals have reliable electricity connections.

- Hospitals in Assam report that water treatment plants, campus roads, laboratories, and new outpatient departments were constructed under various development schemes. However, funding is available only for civil infrastructure. Although costs toward electric cabling can be funded, access to reliable power continues to be a problem. In addition, the process of applying for and receiving these grants is said to be cumbersome. Funding patterns change with political changes, increasing uncertainty.

## Integrative Policies

Integrative policies are the most aspirational. They actively acknowledge the linkage between electricity and the desired outcome, and they also identify the institutional mechanisms through which coordination and coherence help achieve the outcomes related to improved electricity access and suitable policy instruments (Priya et al. 2014) that enable the effective implementation of objectives.

### Health

- The IPHS guidelines are among the few significant public documents that discuss the importance of electricity for functional operating rooms, labor rooms, blood banks, and vaccine storage. They set the minimum standards for providing healthcare across levels of public health facilities. They also provide guidance on designing health facilities in ways that reduce disaster risk (NHM 2012). The guidelines provide uniform standards to enhance public health delivery across India. They allow for flexibility, acknowledging the diversity in priorities across regions and indicating the differences in electricity requirements by different healthcare facility levels. District and subdistrict hospitals must be serviced by electricity with generator backup. The guidelines also encourage the use of solar power, where feasible.
  - CHCs should “have the facility for electricity,” and “infrastructure should be made for use of solar energy/power back-up.”
  - PHCs must have electricity with generator backup. They “should have the facility for electricity.” National Rural Health Mission (NRHM)

guidelines specifically mention the use of untied funds for providing electricity. These funds can be used to pay for facilities' recurring electricity bills (MoHFW 2007).

- Subcenters must have “uninterrupted power supply . . . for which inverter facility/solar power facility is to be provided.”
- The IPHS is integrative, as it includes periodic monitoring mechanisms in the form of facility surveys, which assess whether facilities follow the guidelines on facility requirements. Other policies also use the guidelines to determine eligibility for benefits, such as funding and project selection. Stakeholders observe that implementation of Empowered Action Group (EAG) guidelines in states that have high infant and maternal mortality rates is very poor.<sup>xxv</sup> Lack of coordination between ministries is a major impediment to implementation. Approval and construction activities for one health clinic, for example, were undertaken by multiple line departments that often do not communicate with one another. Initiatives such as the Labour Room Quality Improvement Initiative (LaQshya)<sup>xxvi</sup> and Kayakalp, which certify first referral units and provide monetary incentives to maintain the facility infrastructure, are considered more realistic and effective than the standards under IPHS, which include no incentives. For policy frameworks to be effective, they need to be supported by coordination mechanisms and finance. The Home Ministry's TADP coordinates with district administrations across the country on specific development indicators. It has the information and agency to channel-

ize resources. For example, Jharkhand's district administrations try to link Ayushman Bharat outcomes with TADP, to direct resources where they are most needed. Similarly, requirements for improved sanitation and hygiene outcomes are resourced under Kayakalp and LaQshya. Jharkhand's Convergence Scheme (NHM–Jharkhand 2018), under the National Rural Health Mission, underscores the importance of interdepartmental coordination. The scheme acknowledges the interdependence of various sectors in achieving its outcomes and recognizes that factors such as nutrition, literacy, water and sanitation, communication, and transport affect well-being. Its website states:

“It is imperative to identify and intertwine all these health determinants logically to positively impact the well-being of a person and the overall good health status of families. The need of convergence is widely recognized in all areas to get optimum results in set timeframe for the targeted audience and more so in the sector of health because the determinants of health are varied and are spread over areas like drinking water and sanitation, nutrition, education, livelihood, environment, and social justice which cannot be ignored if Health for All is intended (Jharkhand Rural Health Mission 2020).”

The scheme recommends the coordination of departments across villages and districts (Table 3). Such coordination can ensure that electricity infrastructure in healthcare is well maintained and financed by the government's budgets (Box 4).

Table 3 | **Parties Included under Jharkhand's Convergence Scheme**

LEVEL	PARTIES INVOLVED
Village	Village health and sanitation committees; representatives from Integrated Child Development Services (ICDS) and <i>panchayati raj</i> institutions; accredited social health activists; <i>anganwadi</i> workers; and auxiliary nurse midwives
Block	Block development officers
District	District Commissioner, Planning Monitoring Unit, Directorate of Health Services, public health engineering works, social welfare, civil supplies, public works, electricity board, child development and educational officers
State	Representatives from the Women, Development and Child Welfare; Rural Development; Urban Development; Tribal Welfare; Human Resource and Labour departments; <i>panchayati raj</i> institutions; and the State AIDS Control Society

Source: Authors.

#### Box 4 | Improving Primary Health Centers in Chhattisgarh by Providing Them with Energy

In 2011, the infant mortality rate in rural Chhattisgarh, a state in central India, was higher than the national rural average. Only two-thirds of its primary health centers (PHCs) had regular power supply. To improve access to electricity at PHCs, between 2012 and 2016, the Chhattisgarh State Renewable Energy Development Agency (CREDA) installed 2 Kilowatt (kWp) of off-grid solar PV rooftop systems across 570 PHCs. The initiative has continued through a partnership between CREDA and the Ministry of Health to provide solar-powered electricity to 984 PHCs. The electricity systems are customized based on their present and future energy demand, including the need for energy-efficient appliances. The Chhattisgarh Health Department is funded by the Ministry of Health, the District Mineral Development Fund, Transformation of Aspirational Districts Programme (TADP), and corporate social responsibility (CSR) funds by corporates. CREDA selects vendors to install, operate, and maintain the facilities. After five years, it takes over operations and maintenance (O&M). CREDA is involved in all aspects of system design and operation, from selecting central system specifications to ensuring that components conform to national standards. Clearly identifying the responsibility for O&M is the main reason why the program has been a success.

Source: Ramji et al. 2017; SEforAll 2019

#### Education

The government of Rajasthan is trying to improve digital literacy at Utkrisht schools by providing solar-based electricity to schools. It is raising funds for the effort on its Gyan Sankalp portal (Gyan Sankalp 2019).<sup>xxvii</sup> The initiative—Solar Schools: Electrifying Rural Primary Schools—is integrative because it acknowledges the need for electricity to achieve outcomes such as improving digital literacy and reducing physical discomfort in schools; recognizes the challenges public schools face in paying for electricity as a service; and includes a clear policy instrument, in the form of a fund, to address this gap.

#### Multisector

Although it depends on external financing, Jharkhand's State Action Plan on Climate Change demonstrates integrative characteristics because it links electricity access with the delivery of critical services. It acknowledges that access to electricity improves adaptive capacity. It promotes solar water pumps for irrigation because they reduce dependence on rainfall and help control greenhouse gas emissions. It also underscores the need to use renewable energy sources for lighting,

cooking, and the generation of green livelihoods. State disaster management plans describe the importance of restoring electricity after disasters. Assam's plan establishes coordination mechanisms between the disaster management authority and electricity departments to conduct risk assessments and develop contingency plans. Support to the education department to improve electricity in schools and relief shelters has resulted in dual benefits: electricity can support people seeking shelter during extreme events and help schoolchildren during normal conditions by improving comfort levels. Schools also served as quarantine centers during the COVID-19 pandemic. Convergence in policies, coordination mechanisms, and financing mechanisms can have far-reaching societal benefits.

## 4. OBSERVATIONS AND RECOMMENDATIONS

Improving integration of reliable electrification mechanisms can enhance the implementation of development policies. The observations and recommendations presented here can drive such integration.

### Policy Frameworks

Although the household focus of existing electrification policies is welcome, future policies must expand the focus to include electrification of health, education, and livelihood sectors. Although electricity departments should respond quickly to electrification requests, the sectoral departments should also plan to meet their electricity needs through complementary efforts. Historically, India adopted a supply-driven planning approach, because its objective was to supply power to all. However, for a variety of reasons, electricity departments were unable to supply power to all. With the ongoing transformation of the electricity sector and the emergence of decentralized renewables, there is a significant opportunity to meet all unmet and under-met electricity demand, by installing appropriate electricity systems.

Some policy documents mention “electricity” but fail to provide the instruments to ensure that electricity is indeed supplied, as the Kayakalp and ATL schemes indicate. There has been a push to digitize health and education services without providing the necessary infrastructure and capacity. The nodal authorities must identify the linkages enabling service delivery and create the instruments needed to deliver services. For example, suppose the *Immunization Handbook* for Health Workers synchronizes with an integrative document such as the IPHS. It could address some of the current gaps, such as not linking electricity requirements to

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ice-lined refrigerators. Sectoral standards are needed that allow flexibility and provide an essential reference for how electricity and delivery of services can be better integrated.

For some schemes, providing access to electricity is a prerequisite for accessing their benefits. Such a requirement puts the onus for electrification on the individual facilities rather than on the government departments. Policies and departments have to ensure that the required infrastructure is available where needed. If a health scheme is required, the lack of infrastructure should not hamper its implementation. One way to ensure implementation is to build flexible budgets in schemes to fund infrastructure improvement or expand department-level untied budgets.

## Coordination

Coordination between ministries and line departments, ground-level practitioners, and communities during the project design phase allows for a better understanding of roles and responsibilities. Sometimes individual policies may not be integrative and may need to be applied alongside related policies to better integrate their approaches to achieving sectoral outcomes. For example, Assam's solar policy operationalizes Assam's overall energy vision. The solar policy details incentive structures and mechanisms to bridge the reliable electricity access gap in remote regions. It demonstrates how an action-oriented policy can complement an idea-based policy. Policies are designed to complement one another and set up a structure of coordination that can be improved to achieve results.

Harmonization with line departments and user agencies is imperative, as illustrated by the experience of one EAG state. According to a state-level health expert, the Renewable Energy Department installed decentralized solar solutions at many health centers without assessing the need for these solutions or discussing the effort with the health department. A post-implementation study found that half the solarized clinics had since been closed—a consequence of insufficient coordination. Reaching out to the local health department to identify healthcare centers needing reliable electricity could have eliminated the losses and supported the right set of health centers.

In schools, outcomes such as better attendance and reduced dropouts are clearly linked to WASH and electricity, as elaborated in guidelines provided by the WHO (Adams et al. 2009). The health sector requires similar integration.

## Information and Tools

Accessible and reliable data are critical to informed decision-making. The way datasets are organized and made accessible also indicates the agency's intent in influencing how data can be used (Shaxson et al. 2020). Governments in Sub-Saharan Africa use sector-specific datasets housed under each ministry to inform policies (Odarno 2020). This practice disincentivizes attempts to integrate action. It is also common in India.

A notable exception is TADP's Champions of Change Dashboard, which collects and tracks 49 performance indicators across the health, nutrition, education, agriculture, and water resources; financial inclusion and skill development; and basic infrastructure sectors in consultation with the corresponding ministries. NITI Aayog also attempts to validate some of these data by working with nongovernment agencies.

Similarly, WRI's Energy Access Explorer is a platform that links electricity and development data to reduce unmet and under-met demand (Mentis et al. 2019). It uses geospatial, demand-driven planning approaches to prioritize electrification decisions.

## Finance

Implementation agencies must be given the freedom and flexibility to use financial instruments to manage implementation by their departments and ministries. Although having a budget is essential, policies that explicitly identify the costs associated with electrification (both one-time and recurring) give agencies more flexibility to focus on improving the reliability and sustainability of their electrification plans. Processes that clarify the allocation and responsibility of "who will fund what?" are also important for operationalizing the plans. For example, the State Action Plans on Climate Change include detailed action plans for each sector and list the finance needed to implement them. However, states' expectations regarding additional financial allocation from the central government are often delayed or sometimes do not come through, undermining their ability to implement these plans.

Decision-makers should move away from the conventional method of merely monitoring the physical progress and utilization of budgets. A more comprehensive and systematic monitoring and evaluation framework is required to understand how a policy can respond to evidence in a timely fashion. The Evaluation Study of BRGF provides a list of assets created under the program and the money used for each activity (Planning



Commission 2014). It does not evaluate the impact of these assets on well-being, however. Only household electricity access, not institutional access, is discussed.

## 5. THE WAY FORWARD

For Indian states to improve service delivery, the electricity needs of health facilities and schools need to be assessed. A robust data governance mechanism is critical for integrative action and evidence-based policymaking. However, as India has witnessed with other cross-sectoral and centralized statistical, planning, and implementation data governance, diverse contexts must support oversight mechanisms that ensure data credibility.

Finance is largely unavailable to ensure reliable electricity supply to schools and health facilities. Some directives, such as those governing the use of untied funds, need to be more flexible in allowing these facilities to prioritize the reliable and sustainable electricity needed for improving the delivery of essential services.

Integration can help make policies transformative. Integrative policies should therefore be a priority. Departmental silos in public administration have resulted in linkage gaps between critical input departments (such as electricity and water) and demand-generating departments (such as health and education).

The health and education sectors can draw on the existing integrative planning and mainstreaming frameworks to enhance electricity integration. These initiatives evaluate existing policies at the design, implementation, and monitoring and evaluation stages to determine how they can be transformed in ways that increase gender equity.

Further research should focus on linking the findings of this paper with empirical evidence on service delivery outcomes. It should be participatory, including all actors—community leaders, civil society organizations, legislators—that can help improve implementation through constant support and awareness, and motivate change across scales.

## APPENDIX A: POLICIES REVIEWED FOR THIS PAPER

Table A1 | Policies Reviewed in This Paper

SECTOR/POLICY	NODAL AGENCY	NATIONAL OR STATE
<b>Education</b>		
BIS 8827-1978 (Reaffirmed on 2007): Recommendations for Basic Requirements of School Buildings	Minister of Human Resource Development	National
Eklavya Model Residential Schools (EMRS)	Ministry of Tribal Affairs	National
Infrastructure for Knowledge Sharing (DIKSHA)	School and Literacy Department	National
Kasturba Gandhi Balika Vidyalaya	Department of Education	National
Rashtriya Madhyamik Shiksha Abhiyan (RMSA)	Department of School Education and Literacy, Ministry of Human Resource Development	National
Samagra Shiksha Abhiyan 2018–19	Department of School Education and Literacy, Ministry of Human Resource Development	National
Sarva Shiksha Abhiyan	Department of School Education and Literacy, Ministry of Human Resource Development	National
Assam Right of Children to Free and Compulsory Education Rules, 2011	Department of Education	Assam
Assam School Education Bill (Draft Bill)	Directorate of Secondary Education	Assam
Axom Sarba Siksha Abhayan Mission	Directorate of Elementary Education	Assam
DRISTI (School Assessment and Monitoring)	Directorate of Secondary Education	Assam
Gunotsav	Directorate of Elementary Education	Assam
Introduction of Tele-education through Virtual Classrooms	Directorate of Secondary Education	Assam
Kasturba Gandhi Balika Vidyalaya Scheme (KGBVS)	Directorate of Elementary Education	Assam
Mid-day Meals	Ministry of Human Resource Development	Assam
Model Schools	Directorate of Secondary Education	Assam
Rajiv Gandhi Computer Literacy Programme (RGCLP) & ICT at School Scheme	Directorate of Secondary Education	Assam
Sampriti Bhojan	Directorate of Elementary Education	Assam
Siksha Khetra	Directorate of Secondary Education	Assam
Atal Tinkering Lab	Jharkhand Education Project Council (JEPC)	Jharkhand
SSA ICT and Digital initiative Scheme	Jharkhand Education Project Council (JEPC)	Jharkhand

SECTOR/POLICY	NODAL AGENCY	NATIONAL OR STATE
SSA Kasturba Gandhi Balika Vidyalaya	Jharkhand Education Project Council (JEPC)	Jharkhand
SSA Menstrual Hygiene Management	Jharkhand Education Project Council (JEPC)	Jharkhand
SSA Model School Scheme	Jharkhand Education Project Council (JEPC)	Jharkhand
SSA State Plan Civil Works: Infrastructure Development Programme under Jharkhand Education Project Council	Jharkhand Education Project Council (JEPC)	Jharkhand
Chatrawas (Hostel) Scheme	Department of Social Justice and Empowerment	Rajasthan
E-Sakhi Yojna	Department of Information Technology & Communication	Rajasthan
Guidelines for vocational schools	Department of Education	Rajasthan
Joyful Saturday initiative of Rajasthan Government	Department of Education	Rajasthan
Rajasthan Education Initiative	Department of Education	Rajasthan
Rajasthan Right of Children to Free and Compulsory Education Rules, 2011	Department of Education	Rajasthan
Solar Schools: Electrifying Rural Primary Schools	Department of Education	Rajasthan
Utkrisht Vidhyalaya Yojana	Department of Education	Rajasthan
<b>Health</b>		
Clinical Establishments (Registration and Regulation) Act, 2010	Ministry of Health and Family Welfare	National
India Newborn Action Plan	Ministry of Health and Family Welfare	National
Indian Public Health Standards Guidelines for Community Health Centres	Directorate General of Health Services, Ministry of Health and Family Welfare	National
Indian Public Health Standards Guidelines for District Hospitals	Directorate General of Health Services, Ministry of Health and Family Welfare	National
Indian Public Health Standards Guidelines for Primary Health Centres	Directorate General of Health Services, Ministry of Health and Family Welfare	National
Indian Public Health Standards Guidelines for Subcentres	Directorate General of Health Services, Ministry of Health and Family Welfare	National
Maternal and Newborn Health (MNH) Toolkit	Ministry of Health and Family Welfare	National
Mission Indradhanush	Ministry of Health and Family Welfare, Government of India	National
National AIDS Control	Ministry of Health and Family Welfare	National
National Health Policy	Ministry of Health and Family Welfare	National
National Leprosy Eradication	Ministry of Health and Family Welfare	National

SECTOR/POLICY	NODAL AGENCY	NATIONAL OR STATE
National Population Policy	Ministry of Health and Family Welfare	National
National Programme for Control of Blindness and Visual Impairment (NPCB&VI)	Ministry of Health and Family Welfare	National
National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases	Ministry of Health and Family Welfare	National
National Rural Health Mission	Ministry of Health and Family Welfare	National
National Vector Borne Disease Control Programme (NVBDCP)	Ministry of Health and Family Welfare	National
Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA)	Ministry of Health and Family Welfare	National
Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+A)	Ministry of Health and Family Welfare	National
Revised National Tuberculosis Control	Ministry of Health and Family Welfare	National
Surveillance Program for Communicable Diseases	Ministry of Health and Family Welfare	National
Universal Immunization Programme (UIP)	Ministry of Health and Family Welfare	National
NHM State Project Implementation Plan	Health and Family Welfare Department	Assam
Atal Amrit Abhiyan	Health and Family Welfare Department	Assam
Boat Clinic Initiative	National Rural Health Mission and the Centre for Northeast Studies and Policy Research (CNES)	Assam
Chief Minister's Free Diagnostic Services Programme	Health and Family Welfare Department, National Health Mission	Assam
Integrated Child Development Services (ICDS)	Ministry of Health and Family Welfare, Government of India	Assam
Population & Women Empowerment Policy of Assam	Health and Family Welfare Department	Assam
PPP with Charitable Hospital	Health and Family Welfare Department	Assam
PPP with Tea Garden Hospitals	Health and Family Welfare Department	Assam
Sanjeevani Village Health Outreach Programme	Health and Family Welfare Department	Assam
Tribal RCH Programme	Health and Family Welfare Department	Assam
Immunization Handbook for Health Workers (Routine Immunization Services under NHM)	National Health Mission; Health Department	Jharkhand
NHM Scheme: Convergence	National Health Mission; Health Department	Jharkhand

SECTOR/POLICY	NODAL AGENCY	NATIONAL OR STATE
NHM Scheme: Mobile Medical Unit	National Health Mission; Health Department	Jharkhand
NHM Scheme: Untied Fund	National Health Mission; Health Department	Jharkhand
NHM State Project Implementation Plan– Jharkhand	Department of Health, Medical Education and Family Welfare	Jharkhand
Arogya Online (Hospital Management Information System)	Department of Medical, Health and Family Welfare; RajComp Info Services Ltd. (RISL), (formerly RajCOMP)	Rajasthan
Computerised Human Resource Information System (CHRIS)	Rajasthan National Health Mission	Rajasthan
E-Upkaran Equipment Management and Maintenance System (EMMS)	Rajasthan Medical Services Corporation Limited	Rajasthan
Female Death Report	Rajasthan National Health Mission	Rajasthan
Health Vision 2025	Medical Education Department	Rajasthan
Janani Shishu Suraksha Yojana	National Health Mission, Government of Rajasthan	Rajasthan
Kushal Mangal Karyakram (KMK)	Rajasthan National Health Mission	Rajasthan
MukhyaMantri Nishulk Janch Yojana	Department of Medical, Health and Family Welfare	Rajasthan
National Fluorosis Control and Prevention Program (NPPCF)	Department of Medical, Health and Family Welfare	Rajasthan
NHM State Project Implementation Plan - Rajasthan	Department of Medical, Health and Family Welfare	Rajasthan
Online Janani Suraksha Yojana (JSY) and Subhalaxmi Payment System	Rajasthan National Health Mission	Rajasthan
Pregnancy, Child Tracking and Health Services (PCTS) Management System	Department of Medical, Health and Family Welfare	Rajasthan
Proactive and Optimum care of children, through Social- Household Approach for Nutrition (POSHAN)	National Health Mission, Government of Rajasthan	Rajasthan
Rajasthan Government Clinical Establishment (Registration and Regulation) Rules, 2013	Department of Medical, Health and Family Welfare	Rajasthan
Rajasthan Mukhyamantri Nishulk Dava Yojana	Department of Medical, Health and Family Welfare	Rajasthan
Strengthening Monitoring to Improve Healthcare Delivery (m-SNA)	Department of Medical, Health and Family Welfare	Rajasthan
Telemedicine Services Project	Rajasthan National Health Mission	Rajasthan
<b>Electricity</b>		
General Specifications for Electrical Works	Central Public Works Department	National

SECTOR/POLICY	NODAL AGENCY	NATIONAL OR STATE
Grid-Connected Solar Rooftop Program	Ministry of New and Renewable Energy	National
National Electricity Plan	Ministry of Power	National
Saubhagya	Rural Electrification Corporation Limited,	National
Assam Disaster Management Plan	Assam Power Distribution Company Limited	Assam
Assam Energy Vision	Assam Power Distribution Company Limited	Assam
Assam Solar Energy Policy 2017	Assam Power Distribution Company Limited	Assam
State Renewable Energy Action Plan	NITI Aayog along with state departments	Assam
Gender Action Plan for Jharkhand Power System Improvement Project (JPSIP) (Annex Volume-3)	Jharkhand Urja Sancharan Nigam Limited	Jharkhand
Jharkhand Power for All	Energy Department	Jharkhand
Jharkhand Power Policy Draft 2018	Energy Department	Jharkhand
Mini Grid Policy	Energy Dept; Jharkhand Renewable Energy Development Agency	Jharkhand
State Solar Power Policy 2015	Energy Department and Jharkhand Renewable Energy Development Agency	Jharkhand
Grid-Connected Solar Rooftop Program	Ministry of New and Renewable Energy	Rajasthan
Rajasthan Solar Energy Policy	Rajasthan Energy Department	Rajasthan
<b>Disaster management</b>		
Assam State Disaster Management Plan	Revenue and Disaster Management Department	Assam
Assam State Disaster Management Policy	Revenue and Disaster Management Department	Assam
Rajasthan State Disaster Management Plan	State Disaster Management Authority	Rajasthan
<b>Climate</b>		
Assam State Action Plan on Climate Change	Department of Environment and Forests	Assam
Jharkhand State Action Plan on Climate Change	Department of Environment and Forests	Jharkhand
Rajasthan State Action Plan on Climate Change	Department of Environment and Forests	Rajasthan
<b>Multisector development</b>		
Aspirational District Programme	Ministry of Planning (NITI Aayog)	National

SECTOR/POLICY	NODAL AGENCY	NATIONAL OR STATE
Axom Adarxo Gram Yojana	Transformation and Development Department	National
MDoNER VISION 2020	Ministry of Development of North Eastern Region	National
MLA's Area Development Scheme	Transformation and Development Department	National
Multisectoral Development Programme (MsDP)	Ministry of Minority Affairs	National
National Rural Drinking Water Programme (NRDWP)	Department of Water Resources	National
National Rurban Mission (NRuM)	Ministry of Rural Development	National
Non-lapsable Central Pool of Resources (NLCPR) scheme	Ministry of Development of North Eastern Region	National
Northeast Special Infrastructure Development Scheme (NESID)	Ministry of Development of North Eastern Region	National
North Eastern Council Regional Plan	North Eastern Council	National
Pradhan Mantri Jan Vikas Karyakram (PMJKV)	Ministry of Minority Affairs	National
Rural Infrastructure Development Fund (RIDF)	National Bank for Agriculture and Rural Development	National
Scheme of Grant in Aid to Voluntary and other organizations working for Scheduled Castes	Ministry of Social Justice and Empowerment	National
Scheme of Grant in Aid to voluntary organizations working for Scheduled Tribes	Ministry of Tribal Affairs	National
Social and Infrastructure Development Fund (SIDF)	Ministry of Development of North Eastern Region	National
Special Central Assistance–Tribal Sub Plan (SCA–TSP)	Department of Welfare of Plain Tribes and Backward Classes	National
Assam Vision 2030	Transformation and Development Department	Assam
Mega Mission Society–Chief Minister Samagra Gramya Unnayan Yojana (MMS–CMSGUY)	Assam Government	Assam
Jharkhand Vision and Action Plan 2021	Dept of Planning cum Finance	Jharkhand
Backward Regions Grant Fund (BRGF)	Rural Development and Panchayati Raj Department	Rajasthan
Rajasthan Water Supply and Sewerage Corporation Act 1979	Department of Water Resources	Rajasthan

## ABBREVIATIONS

ANC	Antenatal Care
ATL	Atal Tinkering Lab
BRGF	Backward Regions Grant Fund
CHC	Community Health Centre
COVID-19	Coronavirus Disease of 2019
EAG	Empowered Action Group
H&WC	Health and Wellness Centre
ICDS	Integrated Child Development Scheme
ICT	Information and Communications Technology
IPHS	Indian Public Health Standards
INR	Indian Rupee
MoE	Ministry of Education
MoF	Ministry of Finance
MoHFW	Ministry of Health and Family Welfare
MoP	Ministry of Power
MoWCD	Ministry of Women and Child Development
NHM	National Health Mission
NIEPA	National Institute of Educational Planning and Administration
PHC	Primary Health Centre
PPP	Public Private Partnership
SDG	Sustainable Development Goal
SSA	Sarva Shiksha Abhiyan
TADP	Transformation of Aspirational Districts Programme
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization

## ENDNOTES

- i. Each PHC covers 20,000 people in hilly, tribal, or difficult areas. Second-level referral centers cover 30,000 people.
- ii. Chen et al. do not discuss the impact of this change on the agriculture sector, but they do note that farms continue to receive eight hours of uninterrupted electricity supply.
- iii. Integrated Child Development Service (ICDS) is a central-government-sponsored scheme that provides supplementary nutrition, immunization, and pre-school education to children.
- iv. CHCs are designed to provide healthcare for cases referred from the PHC level. They cater to approximately 80,000 people in tribal, hilly, and desert areas and 120,000 people in plain areas.
- v. Under the Ayushman Bharat scheme, 1.5 million H&WCs are to be created by transforming existing subcenters and PHCs into centers that provide comprehensive care near people's homes.
- vi. The Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA) policy envisages the creation of tertiary healthcare capacity in medical education, research, and clinical care across the country. It includes setting up All India Institute of Medical Science-like organizations and upgrading existing medical colleges and district hospitals.
- vii. SSA is a national program aimed at universalizing primary education by making free and compulsory education to children between the ages of 6 and 14 a fundamental right.
- viii. MSS is a Jharkhand state scheme that aims to establish 3,500 model schools in educationally backward regions.
- ix. DIKSHA is an e-learning portal launched by the Ministry of Human Resource Development that enables smooth interactions between students and teachers.
- x. E-Sakhi is a digital literacy program focused on improving digital literacy among young women.
- xi. This program seeks to ensure the availability of a minimum set of diagnostic services at government health institutions.
- xii. This program aims to reduce the maternal mortality rate.
- xiii. This toolkit lays out uniform and standard designs and protocols for setting up state-of-the-art maternal and newborn facilities at different levels.
- xiv. These guidelines provide information on the level of infrastructure and care for different levels of PHCs.
- xv. A health subcenter is the lowest rung of the referral pyramid of health facilities. It is established for every 5,000 people in plain areas and for every 3,000 people in hilly, tribal, and desert areas.
- xvi. EMRS aims to improve access to quality education in tribal areas.
- xvii. This scheme provides room, board, and education to students from socially and economically backward families.
- xviii. The ATL provides students with practical exposure and hands-on training in STEM (science, technology, engineering, and mathematics), using tools and equipment in a laboratory environment.
- xix. Saubhagya aims to provide free electricity connections to all households interested in being connected (both Above the Poverty Line and poor families) in rural areas and poor families in urban areas.
- xx. The Assam Energy Vision (Draft) serves as the foundation for developing an energy roadmap that reflects changing energy needs, promotes economic growth, and ensures affordable and reliable energy access.
- xxi. The MLA-ADS and MPLADS allows members of the legislative assembly and parliament to improve community assets in their constituencies.
- xxii. The BRGF provides financial resources for supplementing and converging existing developmental inflows into identified districts to reduce regional imbalances in development.
- xxiii. The PMJKV seeks to provide better infrastructure facilities to minority communities, particularly in the fields of education, health, and skill development.



- xxiv. The SCA-TSP is a grant to support family-oriented income-generating schemes and self-help groups and establish critical infrastructure in tribal communities.
- xxv. EAG states include Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttarakhand, and Uttar Pradesh.
- xxvi. The LaQshya scheme was introduced by the MoHFW to reduce preventable maternal and newborn mortality, morbidity, and stillbirths associated with the care around delivery in labor rooms and maternity operation theaters and ensure adequate institutional maternity care.
- xxvii. Utkrish schools are primary schools designated by Rajasthan Education Department as "Centres of Excellence."

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## ABOUT WRI INDIA

WRI India is a research organization that turns big ideas into action at the nexus of environment, economic opportunity, and human well-being.

### Our Challenge

Natural resources are at the foundation of economic opportunity and human well-being. But today, we are depleting Earth's resources at rates that are not sustainable, endangering economies and people's lives. People depend on clean water, fertile land, healthy forests, and a stable climate. Livable cities and clean energy are essential for a sustainable planet. We must address these urgent, global challenges this decade.

### Our Vision

We envision an equitable and prosperous planet driven by the wise management of natural resources. We aspire to create a world where the actions of government, business, and communities combine to eliminate poverty and sustain the natural environment for all people.

### Our Approach

#### COUNT IT

We start with data. We conduct independent research and draw on the latest technology to develop new insights and recommendations. Our rigorous analysis identifies risks, unveils opportunities, and informs smart strategies. We focus our efforts on influential and emerging economies where the future of sustainability will be determined.

#### CHANGE IT

We use our research to influence government policies, business strategies, and civil society action. We test projects with communities, companies, and government agencies to build a strong evidence base. Then, we work with partners to deliver change on the ground that alleviates poverty and strengthens society. We hold ourselves accountable to ensure that our outcomes will be bold and enduring.

#### SCALE IT

We don't think small. Once tested, we work with partners to adopt and expand our efforts regionally and globally. We engage with decision-makers to carry out our ideas and elevate our impact. We measure success through government and business actions that improve people's lives and sustain a healthy environment.