

Energy Dialogues

2016-17



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Who We Are

Shakti Sustainable Energy Foundation seeks to facilitate India's transition to a cleaner energy future by aiding the design and implementation of policies that promote clean power, energy efficiency, sustainable urban transport and climate action.

Advancing smart energy policies will be key to meeting the defining challenge of the next generation—how to provide millions of Indians with reliable, affordable, secure access to energy in a sustainable manner.

The energy choices that India makes today will be of profound importance for our future. Meaningful policy action on India's energy challenges will

strengthen national energy security, support development and keep our environment clean.



Our Approach

- We believe robust energy policy frameworks are necessary for large-scale, transformative change.
- We bring together experts from government (national, state and local decision-makers), business, civil society and academia to craft effective energy policies.
- We evaluate the results of our own work rigorously, measuring success using clear metrics based on quantifiable clean energy contributions.
- We work through cross-sectoral strategies with the goal of achieving synergistic results and broad impact.

Our Vision

A clean and secure energy future



Board of Directors

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United Nations

Naina Lal Kidwai

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Chief Executive Officer
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MacArthur Foundation India

Arvind Mahajan

Former Senior Director
KPMG India

Message from the Chairman

2016 was characterized by important developments that will define India's energy and climate trajectory for many years to come. A strong consensus has evolved on the need for energy policies to support development as well as sustainability in order to reap major benefits for citizens, businesses and society at large.

This present transition is characterized by immense opportunity for India, which today is faced with a wider range of energy choices. Renewable energy has become cost competitive with other sources and can provide utility-scale power to the national grids. More possibilities for large-scale energy efficiency are being found in cities and industries. Mini-grids, Decentralized Energy (DRE) and better transmission and distribution models hold the promise of more reliable and affordable energy.

I am enthused to see Shakti making significant contributions towards this transition by aiding the design and implementation of policy solutions that foster a

cleaner growth path for India. Innovative efforts enabled by Shakti—be it in clean energy financing, GHG estimation and analysis, fuel economy standards, sustainable urban development, the transition from HFCs and cleaner brick production—have boosted the understanding of critical energy challenges and their solutions. With the transformational NDCs laying out clear markers for domestic climate action, I am positive that these efforts will continue to play a greater and meaningful role in India's efforts to tackle climate change.

I congratulate Shakti on the eventful year gone by and express my gratitude to all the donors, partners and stakeholders for their support.

Jamshyd Godrej

Board Chair

Shakti Sustainable Energy Foundation



Message from the CEO

2016 started with excitement over the Paris Agreement, which provided a new context and level of ambition for energy and climate action for India. The Agreement is just the first step in the global response to climate change. Much work lies ahead and India has an opportunity to play a leading role in turning the Paris commitments into action.

In cognizance of this, the Government has announced several decisive initiatives: ambitious targets on electric vehicles, the commitment at Kigali to phasedown HFCs, the leapfrog to Bharat Stage VI vehicular emission norms, the development of fuel efficiency standards for Heavy Duty Vehicles, the development of a national policy on renewable energy-based minigrids and the introduction of reforms for the power sector. Progress in also being made on the state front with momentum being built for state-level renewable and minigrid policies. The Smart City Mission is being rolled out. The national LED lamp program has made significant progress and the aggregated procurement model is being rolled out to

cover fans, air conditioners, pumps and, most recently, electric vehicles. The success of the Perform Achieve and Trade Scheme is evident. Throughout the past year, Shakti has helped to shape and progress many of these developments. Shakti has also worked to bring about change at the state-level by enabling policy action and implementation in several states across the country.

I would like to thank our staff, partners and donors, who have contributed to these achievements.

The subsequent pages outline in more detail some of our key achievements last year. Thank you for your support and interest in our work.

Krishan Dhawan

Chief Executive Officer
Shakti Sustainable Energy Foundation





ENERGY REFORMS
CLEAN POWER
DEMAND
REGULATORY
DISTRIBUTION
ELECTRICITY
POWER
SUPPLY
2030
SOLAR
PUMPS
ELECTRICITY
DISTRIBUTION
MINI-GRID
RENEWABLES
MICRO-GRIDS

UPERC
ELECTRICITY
TECHNOLOGIES
MICRO
GRIDS
3,433 MW
ENERGY
SUSTAINABLE
WATER
UN-ELECTRIFIED
EFFICIENCY
ROADMAP

SOLAR TECHNOLOGY
SOLAR-AGRI PUMPS
WATER
REMOTE AREAS
100 MW
PUMPING
SYSTEMS
ENERGY
ACCESS
RELIABLE
FRAMEWORK
MECHANISMS
GRIDS
RENEWABLES

POWER
INSTRUMENT
ENERGY
INNOVATIONS
UJALA
MEGAWATTS
CLEAN POWER
ELECTRICITY
SUSTAINABLE
ENTERPRISES
SOLUTIONS
SUPPLY
MICRO-GRIDS
DRE
SECI
GPMDG

ELECTRICITY WATER
SOLAR MISSION
ENERGY
DISCOMS REFORMS
UN-ELECTRIFIED
EFFICIENCY
ENERGY
STAKEHOLDERS

ROADMAP
MINISTRY OF POWER
SOLAR-AGRI PUMPS
UJALA
WIND SECTOR
MECHANISMS

FRAMEWORK
CLEAN POWER
SUSTAINABLE
MECHANISMS
WATER
ELECTRICITY
ENERGY
SOLAR
PUMPS
DISTRIBUTION
100 MW
UPERC
POWER
SUPPLY

SOLUTIONS
CLEAN
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STAKEHOLDERS
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MECHANISMS
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ROADMAP
ACCESS

ENERGY
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00 MW
SECTOR

India has strong ambitions to enhance access to clean and sustainable power for its growing population. Over the next two decades, the demand for power is expected to increase significantly. The policy space has seen significant momentum with the Government announcing several programmes and reforms to bridge the gap between power demand and supply. Efforts to mainstream renewable energy are a very positive sign. In addition, several initiatives have been launched to improve power sector output such as round-the-clock power supply and rural electrification schemes. The draft national energy policy aims to set the growth trajectory for the energy sector. In line with these ambitions, Shakti is supporting the clean energy agenda by promoting energy access, renewables, distribution sector reforms and efficiency measures.



SCALING UP MINI-GRIDS FOR RURAL ELECTRIFICATION

In February 2016, Uttar Pradesh announced a promising mini-grid policy, the first of its kind effort to boost mini-grid deployment in a state. The policy aims at closing the electricity gap in Uttar Pradesh where close to half of its population of 38 million has little or no access to electricity. Soon after the policy was announced, Shakti engaged with the Uttar Pradesh Electricity Regulatory Commission (UPERC) to develop a regulatory framework for mini-grid development. After extensive stakeholder consultations, the UPERC released draft regulations for public comments. In April 2016—in just over two months after the mini-grid policy was announced—the UPERC announced the regulations. Efforts facilitated by Shakti have led to the inclusion of important recommendations in the regulations, which will help achieve the state's mini-grid vision. For one, the regulations allow mini-grids to exist in parallel with the grid to supply in both electrified and un-electrified areas. The regulations also specify exit options for mini-grid developers in case the grid arrives or becomes reliable.

Building on this success, Shakti is enabling the development of mini-grid policies and regulations in two more states—Bihar and Odisha. Electrification rates in both the states are low, and there is significant potential to close the energy access gap through mini-grids. In parallel, Shakti is facilitating pilot projects for interconnecting mini-grids with the distribution grid in Uttar Pradesh and Bihar.

At the national level, Shakti is a member of the expert committee constituted by the Ministry of New and

Shakti is a member of the expert committee constituted by the Ministry of New and Renewable Energy to draft the first ever national policy on renewable energy based mini-grids.



Renewable Energy to draft the first ever national policy on renewable energy based mini-grids. Throughout 2016, Shakti worked with the committee members, to contribute practical and feasible recommendations to the draft national mini-grid policy, which is intended to mainstream mini-grids and micro-grids across India.

STATES TAKE STRIDES TOWARDS INCREASING RENEWABLE ENERGY DEPLOYMENT

A number of Indian states are actively putting in place the right policy and regulatory environment for renewable energy deployment. There is also an increasing focus on centre-state coordination in advancing renewable energy. In the past, Shakti contributed to the development of India's Renewable Electricity Roadmap 2030, a key initiative launched by the NITI Aayog to promote renewables on a large scale. Building on some of the recommendations from this roadmap, the NITI Aayog set up an advisory group and a steering committee to coordinate renewable energy deployment across ten states. In 2016, each of the ten states received technical support to help develop roadmaps to meet the 2022 targets for renewable energy deployment. Shakti contributed to this process in collaboration with the UK Department for International Development. As of today, most of the states have developed roadmaps and are seeking to work with the Central Government and non-renewable energy rich states to increase renewable energy deployment.

In parallel, Shakti contributed to the development of Bihar's new and renewable energy policy. Efforts facilitated by Shakti helped inform the policy structure required for meeting the 3,433 MW renewable energy target, and a first of its kind target in the country to set up 100 MW mini-grid projects. Overall, this is one of the most comprehensive renewable energy policies to be prepared by any state covering all renewable

energy technologies and proposing specific deployment mechanisms.

In Maharashtra, Shakti facilitated technical assistance to the state nodal agency to promote solar-wind hybrid projects. In Karnataka, Shakti continues to support efforts to refine the integrated resource planning framework, which can be used by stakeholders to meet the future energy demand of a region from a combination of different options.

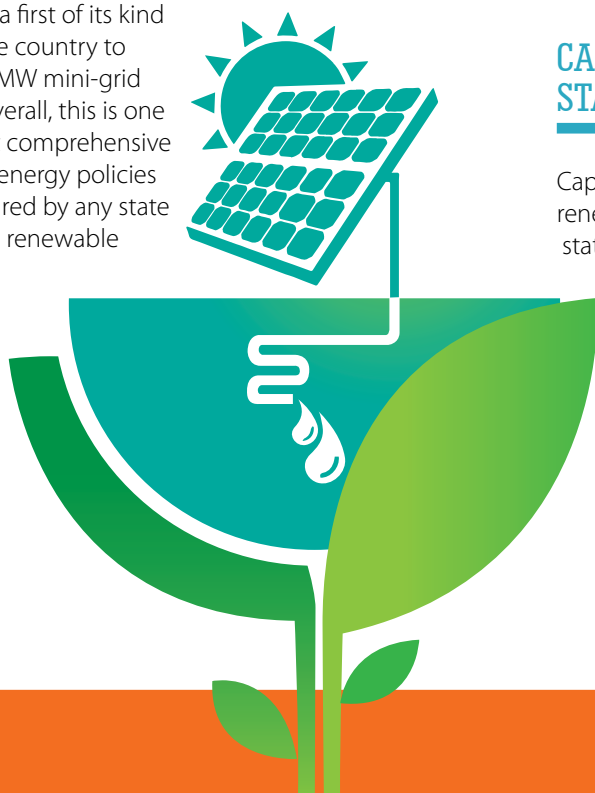
BOOSTING SOLAR-AGRI PUMPS

Solar-agriculture pumps offer a very compelling application of solar technology for many reasons – improving energy access in remote areas, providing cleaner and more reliable energy, replacing costly grid and diesel-pumps, ensuring availability of water during day-time and reducing agricultural power subsidies. The Government has therefore identified solar water pumps as a policy priority with ambitious targets and substantial capital subsidy support.

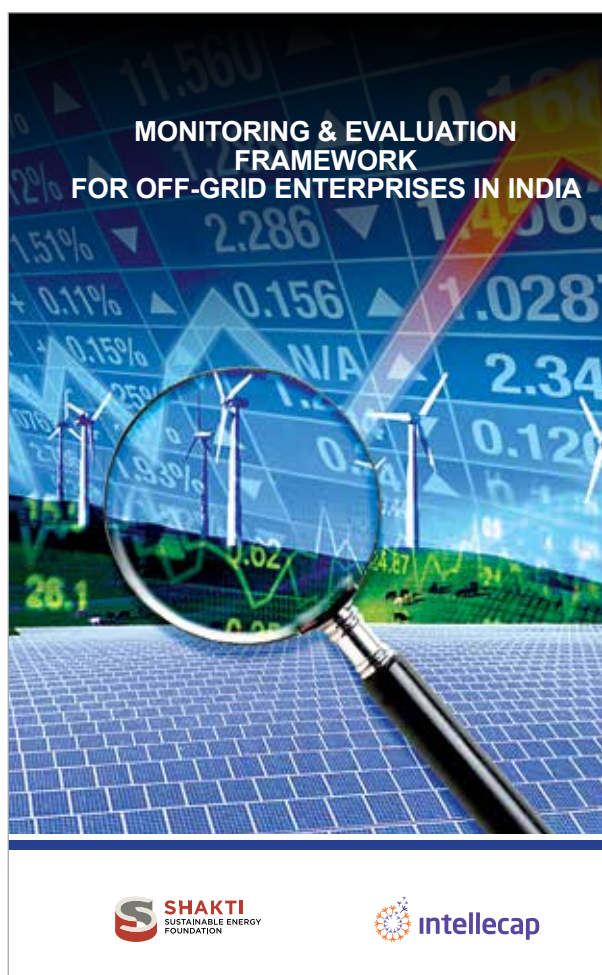
To this end, Shakti has been working to identify ways to harness the full potential of solar pumps. Over the last few years, Shakti engaged with key stakeholders to help design and implement India's solar pump programme to install solar water pumping systems for irrigation and drinking water. Last year, Shakti commissioned the development of a comprehensive state-level implementation roadmap to inform and strengthen the programme. Over 60,000 solar pumps have already been installed under the program with plans for significant expansion. As a next step forward, Shakti has commissioned a socio-impact assessment of the program in four Indian states.

CAPACITY BUILDING OF DRE STAKEHOLDERS

Capacity building programmes for decentralized renewable energy (DRE) enterprises across several states are helping the enterprises deliver clean energy solutions at a faster pace. Enterprises have been provided training and mentorship in the



areas of business development, marketing strategies and technology innovations. Given that finance is an important ingredient to scale up the DRE sector, these efforts have facilitated financial linkages for enterprises to grow their businesses. For example, in Odisha, Shakti's partners have linked Mukti Solar with the Syndicate Bank to finance solar home systems in 500 households in the Kalahandi district.



Training of the Trainer programmes have been organized for banking officials spanning 20 banking institutions from five states with the goal of sensitizing the bankers to create more end-user and enterprise lending for DRE solutions. In addition, a Monitoring and Evaluation (M&E) tool has been developed for DRE enterprises as well as alternative financing instruments to enhance the flow of capital into DRE solutions. The financial instrument will soon be launched to facilitate capital infusion into DRE enterprises.

An institutional strengthening roadmap is being developed for the Bihar Renewable Energy Development Agency, the state nodal agency for Bihar, that will recommend actions that the agency can take to adopt DRE on a large scale.

SCALING UP THE RENEWABLE ENERGY MARKET

Several efforts facilitated by Shakti are helping to scale up the renewable energy market in various states. India's first solar-wind hybrid project is taking shape in Anantapur, Andhra Pradesh and is expected to generate 150 GW of renewable energy. Shakti is facilitating technical assistance to the Solar Energy Corporation of India (SECI), a public sector undertaking of the Ministry of New and Renewable Energy, to develop this project. In the same vein, the Green Power Market Development Group (GPMDG) is bringing together government, utilities, regulators, companies and energy developers to scale up renewable energy purchasing in the private sector. So far, the group has worked with over 30 leading businesses to facilitate 200 megawatts (MW) of renewable energy transactions. Members of the GPMDG worked with the Karnataka Electricity Regulatory Commission on a new policy that waives grid usage charges for the first ten years of all solar projects commissioned by March 2018. The GPMDG is now working to scale aggregated renewable energy procurement in industrial parks in Karnataka, Telangana, Tamil Nadu and Maharashtra.

Capacity building programmes for decentralized renewable energy (DRE) enterprises across several states are helping the enterprises deliver clean energy solutions at a faster pace.



CONVENING PLATFORMS PROVIDE CRITICAL POLICY PERSPECTIVES

Shakti is convening several important platforms that are providing inputs to shape policy and regulatory framework required to grow the renewable sector. The High-Level Working Group on Renewable Energy Policy and Finance brings together eminent stakeholders to deliberate on strategic ways to strengthen the renewable energy market, providing specific recommendations on finance, regulatory and technology aspects of renewable energy. These recommendations have already been shared with key

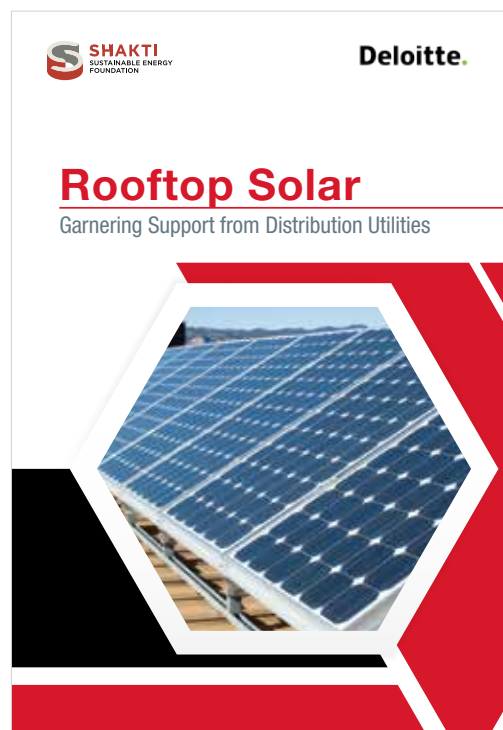
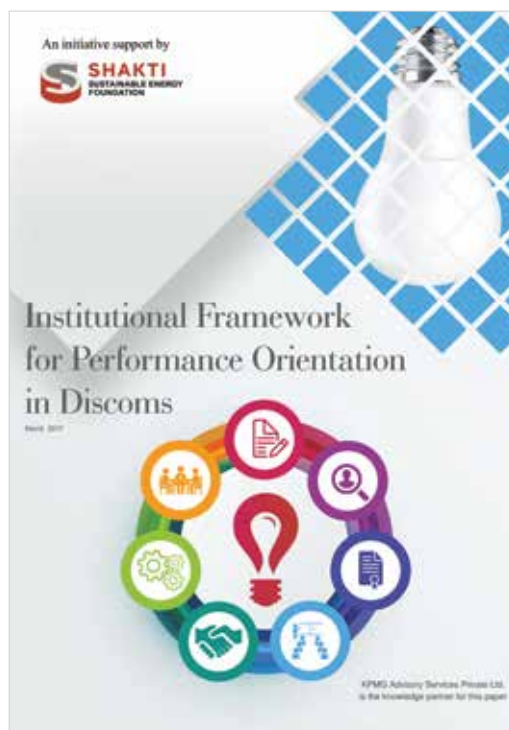
policy makers. The Indian Renewable Energy Federation (IREF) is a pan-India multi-stakeholder platform that works to promote grid, off-grid and standalone RE systems in India. Since it was established, the IREF has provided recommendations to inform several policy developments such generation-based incentives for the wind sector and has facilitated stakeholder engagement and policy dialogue at the state level.

ENGAGING WITH CIVIL SOCIETY

Shakti works with civil society organizations to promote cleaner energy sources and the more

efficient use of electricity. In Rajasthan, efforts are being made to foster better regulatory engagement and processes to promote efficient distribution practices, renewable energy and energy efficiency. In Tamil Nadu, Shakti is supporting civil society actors to educate consumer groups to be proactive in their engagement with decision makers with the goal of finding long-term solutions for reliable electricity. Electricity Consumer Cells are raising consumer awareness on electricity governance issues. In parallel efforts, engagement with a broad spectrum of civil society organizations in select states is helping to facilitate knowledge sharing and discourse building to contribute to informed debates and decision-making processes in the power sector.





STRENGTHENING THE DISTRIBUTION SECTOR

An important area of focus for Shakti is enabling distribution sector reform at the state level. Efforts supported by Shakti have led to the development of an integrated planning framework for the power sector in Karnataka, which is being used to assess the state's future energy demand.

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In parallel, Shakti facilitated a study to develop progressive retail tariff design frameworks for the power sector and another study to assess how Discoms can benefit from better organizational and institutional measures including human resource engagement. The findings of both these studies have been widely disseminated amongst central government and state level stakeholders such as the Ministry of Power, state energy departments, distribution companies and regulatory commissions. The studies are informing the dialogue on distribution sector reforms and have generated interest among state-level stakeholders to examine these issues on more detail.

A study commissioned by Shakti has helped stakeholders understand the implications of grid connected solar PV rooftops on Discoms and proposed a robust framework to incentivize Discoms to support the large-scale deployment of solar rooftop PVs.



UNDERSTANDING THE IMPACT OF INDIA'S LED BULB PROGRAMME

The adoption of efficient lighting technologies to reduce carbon emissions is an important mitigation strategy for India. India's ambitious Unnat Jyoti by Affordable LEDs for All (UJALA) scheme has gained significant momentum since the bulk procurement model was first introduced in Puducherry. Over 260 million LEDs have been sold under the scheme, in addition to which, an equivalent number of LEDs have been sold through market channels. Recognizing the significance of this programme, Shakti supported a study to assess the impact of the UJALA scheme and the effectiveness of its model. The study examines the change in India's lighting market, consumer response to

the programme, and other factors, and suggests ways to strengthen the scheme. The analysis shows how the UJALA scheme has succeeded in creating a large and sustainable market for LED bulbs in India using the no-subsidy, bulk procurement model. The demand for LED bulbs has increased manifold and the retail market price (for the LED bulbs sold beyond UJALA) has dropped significantly. A viable domestic manufacturing industry has been established, efficiency standards are being implemented, accredited testing laboratories have grown and consumer awareness has increased. The scheme needs to target low-income households and small commercial establishments who are still buying incandescent bulbs. The UJALA model can be used for other appliances as well but with monitoring and evaluation processes to promote quality, compliance and proper disposal of old appliances.

Shakti supported a study to assess the impact of the UJALA scheme and the effectiveness of its model.



Understanding the impacts of India's LED bulb programme, "UJALA"



DRIVING DSM AND DR PROGRAMMES TO ENHANCE ENERGY EFFICIENCY

Mainstreaming demand side options can help in mitigating electricity shortages in a cost-effective way.

At the state level, Shakti continues to facilitate technical support for strengthening the DSM ecosystem across Jharkhand, Karnataka and Uttar Pradesh. These efforts span all levels – identifying DSM potential, setting realizable targets, developing policy designs and monitoring and evaluating implementation frameworks, and creating replicable, scalable DSM programmes. The results of these efforts are already underway. Karnataka has developed the first ever annual DSM action plan in compliance with the DSM regulations issued by the Karnataka Electricity Regulatory Commission. Three Discoms in Uttar Pradesh have submitted their DSM plans to the Uttar Pradesh Electricity Regulatory Commission. The Jharkhand Bijli Vitran Nigam Ltd. has notified the formation of a DSM Cell. These efforts have laid the foundation for further action on DSM interventions.

Shakti facilitated the implementation of a low-cost DR programme for the BSES Yamuna Power Limited (BYPL) in New Delhi. The programme was targeted at industrial and large commercial consumers and led to a demand reduction of 17.4 MW over eight DR events. Based on the successful outcome, the BYPL intends to roll out a large-scale DR program covering a larger number of consumers. This can pave the way for the large-scale adoption of similar programs by other Discoms.



PACE
GROWING
AMENITIES
QUALITY
LIFE
OPEN
PUBLIC
CHARGE
SMART
EFFORTS
TRANSPORT
EFFICIENCY
MOBILITY

SUSTAINABLE CITIES
SUSTAINABILITY
CITIES URBAN DEVELOPMENT
EFFICIENCY
DESIGN
SUSTAINABLE CITIES
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SUSTAINABLE CITIES
SUSTAINABILITY

LAST MILE
CONNECTIVITY
PHILANTHROPIC
NEEDS
PASSENGER
COMFORT
BMTc
INFORMED
NETWORK
DEMAND
IMPROVE

IMPROVEMENT
SMART
SMART CITY INDEX
ELECTRIC VEHICLES 2020
ESTIMATION

CITY INDEX
GOVERNANCE
MAINTENANCE
NEEDS
ENVIRONMENT
POTENTIAL

MOBILITY BUS
FUEL CONSUMPTIONS
OPPORTUNITY CREDIBILITY
FAIR QUALITY
INCLUSIVE FORUM DESIGN

RAILWAYS
SIGNIFICANT BENEFITS
DEVELOPMENT IMPROVED
ANALYSIS
FASTER
ADOPTION

PLANNING
ACCELERATE
AUTHORITIES
TECHNOLOGY
IMPORTING
OUTCOME

CAPACITY BUILDING
MV
BUS
SMART
COMFORT
GOVERNANCE
SUSTAINABILITY

CITY INDEX
INSPECTION
SMART CITY INDEX
2020
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PROGRAMMES
SMART
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SMART

INVESTMENTS
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SUSTAINABLE CITIES
E-RICKSHAWS
ENERGY EFFICIENCY
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SUSTAINABILITY
CLEANER
REDUCED CONGESTION

NEEDS
RESEARCH
QUALITY
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RAILWAYS
SIGNIFICANT BENEFITS
FREIGHT TRANSPORT

2022
ECONOMY
URBAN DEVELOPMENT
MODES CITIES MISSION
EFFICIENCY IMPROVED
INCLUSIVE FORUM DESIGN

SMART CITIES MISSION
BICYCLE
RESEARCH
OUTCOME
LAST MILE
BETTER LIVELIHOOD
2022
SMART CITY INDEX
2020
GREEN
FASTER ANALYSIS
ADOPTION
ELECTRIC MOBILITY

INVESTMENTS
BUS SERVICES
PUBLIC TRANSPORT
ROADMAP
MV
PEDDLERS
PASSENGER
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INFORMED
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IMPROVE
LAST MILE
CONNECTIVITY
PHILANTHROPIC
NEEDS



Indian cities are growing at an unprecedented scale and pace because of which the demand for energy, transport, housing and public amenities will significantly increase. The Smart Cities Mission and other urban development programmes launched by the Government are expected to address some of the key challenges that cities will face in the next few years. Cities have an opportunity to pioneer new, innovative blueprints for urban growth. Choices made today will determine the quality of life and the sustainability of cities for decades to come. Against this backdrop, Shakti works to accelerate the transition to sustainable cities with a focus on urban planning, sustainable transport and energy efficiency in the built environment.

THE ROLE FOR PHILANTHROPY AND CIVIL SOCIETY IN CREATING SUSTAINABLE CITIES

In March 2017, Shakti convened a workshop on the theme of 'Low Carbon, Smart and Sustainable Cities' bringing together two important stakeholder groups—philanthropic foundations and civil society—to collaborate and build the new urban mobility agenda. The workshop was an important starting point for a broad discussion about the role that strategic philanthropy and civil society together can play in support of these actions. It aimed to answer these questions: What kind of change is needed for Indian cities in order to fulfill their role as drivers of sustainable development and to shape the post 2015 development agenda? And how can philanthropic

The workshop on 'Low Carbon, Smart and Sustainable Cities' brought philanthropic foundations and civil society to build a common vision for the urban mobility agenda.



organizations and civil society collaborate to build a common vision for this change?

The event was designed as an opportunity for participants to interact in an open and inclusive forum with the goal of identifying implementable solutions for cities and creating a broad roadmap to synergize current efforts. New concepts, tools, and opportunities for action on sustainable cities were presented contributing to the process of learning and linkage-building. Participants from 29 key organizations from across the country, including think tanks and research groups, shared their insights and perspectives. Learning emerging from these discussions can help channel future philanthropic investments in urban mobility across Indian cities.

KNOWLEDGE AND EXPERTISE TO SIX INDIAN CITIES TO SHAPE THEIR SMART CITY ASPIRATIONS

Last year, support from Shakti helped four cities—Visakhapatnam, Kakinada, Jaipur and Udaipur—to include sustainable mobility and built environment components into their Smart City Proposals. Based on the strength of the proposals, all four cities made it to the list of top 20 cities selected for the first round of funding under the Smart City Mission. Now, support provided by Shakti is enabling all four cities to implement the vision plans stated in their proposals. Shakti is also facilitating technical and advisory support to two more cities shortlisted under the Smart Cities Mission—Chennai and Ludhiana. Two of these projects—improving junctions in Udaipur and deploying e-rickshaws in Kakinada—are already showing good results:

Udaipur's junctions to see lesser congestion and pollution

Udaipur's walled city is accessed through ten traditional gates known as 'pols', which are amongst the busiest

street junctions in the city. The streets connecting the junctions serve as major commercial streets. Because of high traffic, the junctions see a lot of traffic congestion and pollution. Adding to traffic problems, on-street parking has reduced the space for clear movement. To improve mobility and accessibility in the walled city area, Udaipur's Smart City Proposal focused on resolving traffic issues at three major junctions—Suraj Pole, Delhi Gate and Hathi Pole.

Shakti engaged with city officials, the Udaipur Municipal Corporation and the traffic police to pilot a new and improved design at the junction. The response from the public was extremely positive. Not only did the new design help to regulate the traffic, it also reduced congestion in the junction area. The design improvement is now a permanent feature of the intersection. It is being tested at other junctions in the city—a critical step in scaling up this outcome. In 2017, the Udaipur Municipal Corporation received the Volvo Sustainable Mobility Award for this project in recognition of its efforts to improve mobility in this corridor.

Kakinada looks to e-rickshaws for cleaner transportation

Kakinada is a tier III Indian city in Andhra Pradesh. In the absence of any formal system of public transportation, Kakinada's Smart City Proposal focused on improving last mile connectivity through cleaner modes of transport. The city proposed to deploy e-rickshaws (electric rickshaws) with a two-fold objective: to promote cleaner transport options and to provide a better livelihood option to cycle rickshaw peddlers by training them to operate e-rickshaws. Shakti engaged with city officials and other stakeholders to draft a strategy for introducing e-rickshaws in the city. The strategy provided advice on procurement, charging stations, stakeholder roles and responsibilities and technical specifications to guide the process. Most of these recommendations were adopted by the Kakinada Municipal Corporation.

Now, routes for a pilot run of the e-rickshaws have been identified. Kakinada has procured over 100 e-rickshaws

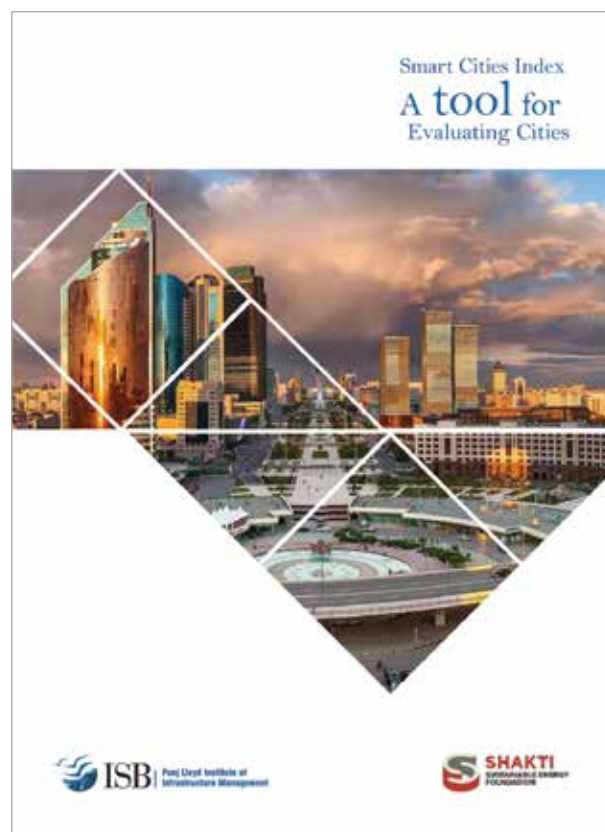


The temporary design structure at the Suraj Pole junction helped ease traffic and congestion in the junction area

and is in the process of enrolling and training cycle rickshaw peddlers as e-rickshaw operators under the programme. An operation plan is being prepared to integrate e-rickshaws with existing transport modes, particularly to support last mile connectivity and provide feeder services. Learning emerging from these efforts can help inform e-rickshaw practices and standards in other cities as well as help bring scale to cleaner transport solutions.

A SMART CITY INDEX

With the implementation of the Mission gradually gaining momentum, a few important questions arise. What does it mean to be a 'smart city'? How can the progress of the cities be monitored? How are cities ranked in terms of being 'smart'? To help address these questions, Shakti has supported the development of a comprehensive Smart City Index, one that ranks cities on the basis of multiple criteria such as economy, governance, environment, mobility and others. The index enables cities to assess their relative positioning in the country in terms of overall quality of life and develop a well-informed plan for improvement. It has evaluated and ranked the 53 Indian cities with a population of more than one million.



BETTER BUS SYSTEMS FOR CITIES

To create a more strategic vision for improved bus services, Shakti has been collaborating with the Bus Karo programme. Bus Karo is a peer-to-peer knowledge sharing network consisting of State Transport Undertakings (STUs) and city bus and private bus operators working to advance bus services in Indian cities. In 2016, the network developed a forward-looking roadmap for reforms in the management of bus STUs drawing attention to the disproportionate amount of taxes levied on STUs as compared to private vehicle users. These and other efforts facilitated by Shakti have enabled the Bengaluru Metropolitan Transport Corporation (BMTCL) get a waiver on its Motor Vehicle (MV) tax, which will help direct more investment towards improving bus services. Recently, the network published a policy paper on the 'Role of Bus aggregators in improving public transport in Indian Cities', which proposes a policy framework for cities to deal with new mobility players such as mobile-based cab aggregators.

TOOLS TO IMPROVE BUS SYSTEMS PILOTED IN HIMACHAL PRADESH AND ANDHRA PRADESH

Shakti has facilitated the development of tools to catalyze better bus systems in India. Three of these tools are being piloted in Himachal Pradesh and Andhra Pradesh in collaboration with the state bus operator i.e. the Himachal Pradesh Road Transport Corporation (HRTC) and the Andhra Pradesh State Road Transport Corporation (APSRTC), helping to prioritize sustainable transport efforts in both states.

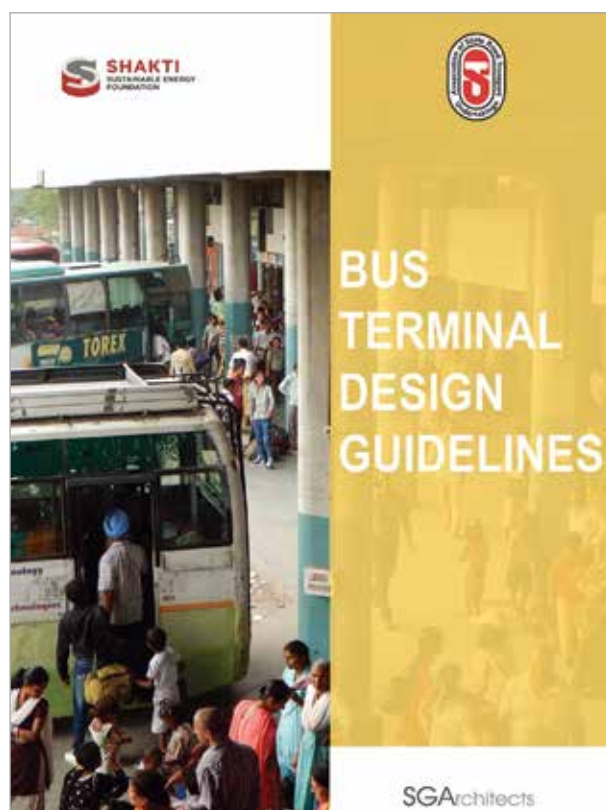
Design guidelines for bus terminals: Both states are planning to improve bus terminals on a large scale in a bid to improve passenger comfort. Each bus terminal is categorized based on its size. The design of these terminals will be informed by the design guidelines for bus terminals, which recommend ways to improve fleet and passenger movement across transit exchanges. The guidelines are being used to design smaller size terminals in Himachal Pradesh and to evaluate large-sized bus terminals for retrofitting in Andhra Pradesh.

Fleet maintenance practices tool: With the demand for public transport growing, it is important that the fuel consumption of the bus fleet is minimized. Well-maintained buses tend to be cleaner, safer and consume less fuel. The fleet maintenance guidelines provide practical ways to enhance the fuel efficiency of buses. They are being piloted in one bus depot

in Himachal Pradesh to review its existing fleet inspection and maintenance practices and to propose recommendations for improvement.

Bus fleet estimation tool: The number of buses required to ply within and between cities is usually estimated based on service needs and passenger expectations. This helps to provide better bus services. The bus fleet estimation tool is being used to estimate the total bus fleet required in Himachal Pradesh to meet its current and projected bus transport demand. The tool will inform the HRTC on the short, medium and long-term investments required to improve bus services.

Shakti has facilitated the development of tools to catalyze better bus systems in India. Three of these tools are being piloted in Himachal Pradesh and Andhra Pradesh helping to prioritize sustainable transport efforts in both states.



FINANCING THE NEW URBAN AGENDA

Shakti is facilitating efforts to develop better financial management frameworks for cities to be able to raise their own resources and to access financial capital. In 2016, Shakti facilitated the development of a Public-Private Partnership (PPP) framework for five priority sustainable urban transport infrastructure projects: city bus operations, bus terminals, Intelligent Transport Systems, Public Bicycle Sharing (PBS) Schemes and street infrastructure.

Another area of focus is municipal bonds. While the potential is high, very few Urban Local Bodies (ULBs) have experience in raising funds through municipal bonds. Also, the financial management practices of the ULBs must be significantly improved for investors to take interest. To raise their credibility, municipalities can develop and release audited balance sheets. In doing so, they will also become eligible for performance grants from the government. In 2016, Shakti supported the development of a model framework for conducting the annual audits of ULBs. This framework is now being used by the Government of Rajasthan to audit the accounts of its 188 ULBs by empaneling chartered accountants for this task – one of the key recommendations of the framework. Already, over half of the ULBs have used this framework to audit their annual accounts for 2015-2016, a first for ULBs in Rajasthan. With this, municipal bonds issued by ULBs with good financial track records can be seen as a good investment opportunity and can help direct more capital towards better performing ULBs. Going forward, Shakti is supporting the development of a framework to issue green municipal bonds for sustainable urban development.

Shakti is facilitating efforts to develop better financial management frameworks for cities to be able to raise their own resources and to access financial capital.





ELECTRIC VEHICLES FOR INDIA'S MOBILITY NEEDS

Another focus area for Shakti is electric vehicles, which offer significant benefits in terms of saving fuel and improving air quality. India's National Electric Mobility Mission Plan 2020 and the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME) scheme have set the stage for electric vehicles in India. In 2016, Shakti facilitated a review of the performance of the first phase of the FAME scheme to help inform its further development. To boost electric mobility at the city level, Shakti supported the development of an implementation roadmap and a cost-benefit analysis of alternative technology pathways for the electrification of public transport systems in two important metros: Bengaluru and Kolkata. This coupled with capacity

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building programmes for city bus authorities looking to deploy electric buses within their fleets are contributing to the planning and development of electric mobility initiatives. More recently, Shakti collaborated with civil society organizations to develop a strategy for philanthropic investments to accelerate the electrification of India's transport sector.

MAKING FREIGHT TRANSPORT SUSTAINABLE

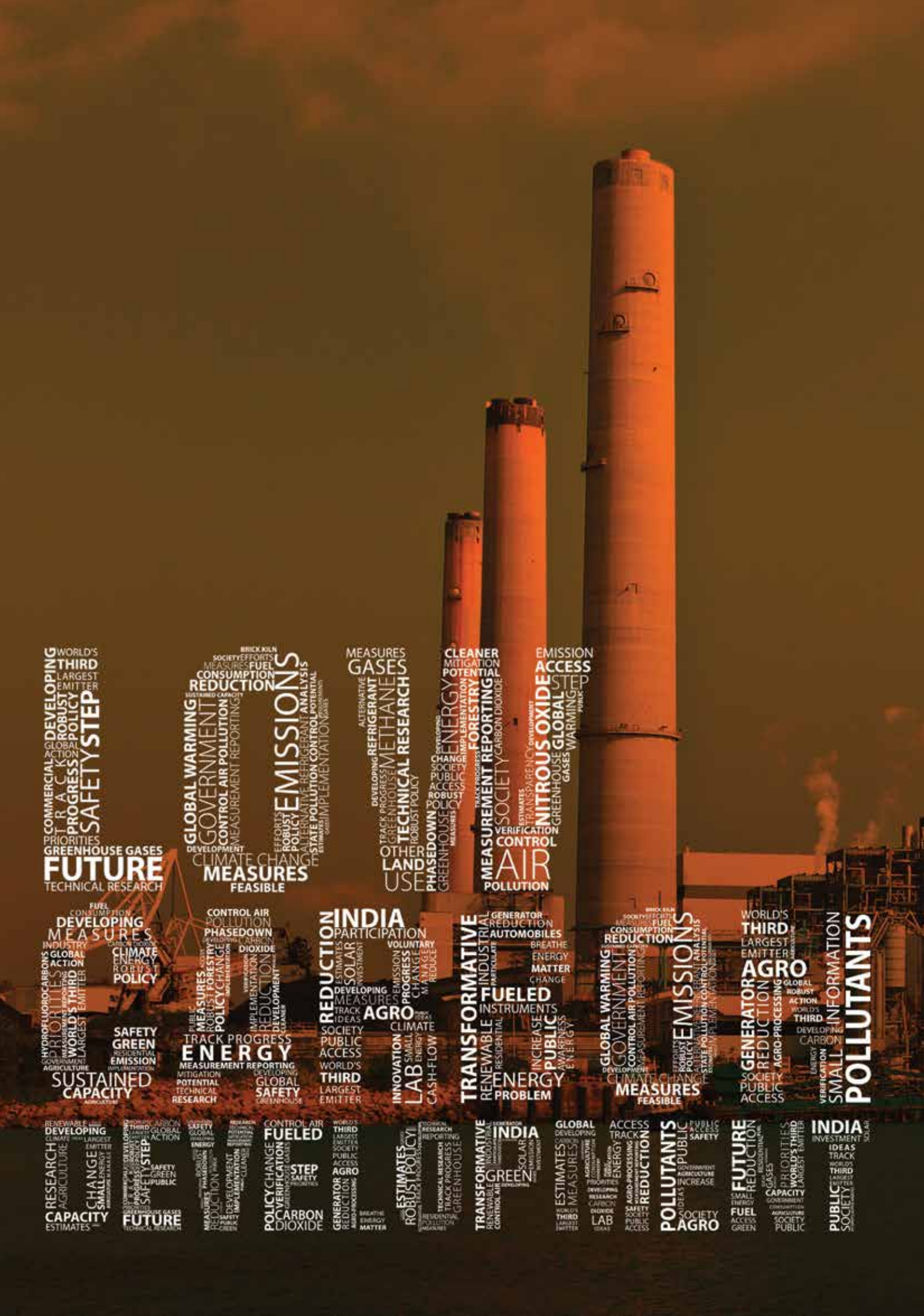
Freight transportation is a vital component of India's economy. But over the last few years, road-based freight transport, which is more emission and energy intensive, has been gradually displacing rail-based

freight transport. To make the freight sector more sustainable, the Government has called for increasing the share of freight transport via railways. In 2016, Shakti supported a study to understand why the movement of three important products—cement, automobiles and container traffic—has declined via rail. One of the key findings relating to cement is that the transport of cement largely occurs over long distance inter zonal routes leaving the short distance intra-regional routes largely untapped. This kind of understanding of commodity transport can help the Railways design better strategies for the transportation of commodities. The analysis has generated significant interest from the Indian Railways as well as the industry associations of these products. Building on this analysis, Shakti is now supporting the development of a policy and infrastructure framework to increase the share of all three commodities in rail freight transport.

Shakti is also focusing on efficient freight transport in the urban context. A study facilitated by Shakti is looking at freight mobility patterns and emissions from urban freight taking Chennai as a case city, based on which a freight management strategy will be developed for Chennai. Shakti is also engaging with the Chennai Freight Partnership led by the Madras Chamber of Commerce and Industry (MCCI) and other partners. The aim of this partnership is to improve efficiency, sustainability and safety in freight movement in Chennai.

CLEANING UP THE TRANSPORT SECTOR

Fuel efficiency standards for vehicles can help reduce the demand for petroleum as well as meet India's target to reduce oil imports by 10 percent by 2022. Good progress has already been made on this front. Fuel efficiency standards are being rolled out for passenger car and being developed for Heavy Duty Vehicles (HDVs). Shakti is contributing to both these efforts. Shakti is also enabling the development of a roadmap for fuel efficiency standards for other vehicle categories such as Light Commercial Vehicles and two-wheelers. In addition, research supported by Shakti has led to the development of a roadmap to strengthen the design and implementation of the Inspection and Maintenance (I&M) programme for in-use vehicles. An important outcome of this research is the development of a position paper that recommends changes to the current testing procedures and the institutional framework needed for the more improved implementation and monitoring of the programme.



As a developing country and the world's third largest emitter of greenhouse gases (GHGs), India plays a key role in spurring global action on climate change. To meet the Nationally Determined Contributions (NDCs) set under the Paris Agreement, action must be taken on several fronts. A major thrust will be on framing robust policy and implementation pathways. Another focus area is the development of robust Measurement, Reporting, and Verification (MRV) systems to track progress. These priorities are reflected in several initiatives launched by the Government over the last year. Shakti is building on the work that is already underway in these areas to help drive the transition required to meet the NDCs.

A MORE INFORMED DISCOURSE ON INDIA'S STANCE ON THE HFC PHASEDOWN

In October 2016, India along with nearly 200 other countries adopted an agreement in Kigali, Rwanda to phase down the use of hydrofluorocarbons (HFCs). India agreed to move forward its proposed freeze year by three years from 2031 to 2028 and its proposed baseline by four years from 2028-2030 to 2024-2026.

Several efforts facilitated by Shakti have informed India's stance on the global phasedown of HFCs as well as led to a more informed policy discourse in the country. Over the last few years, Shakti has supported a wealth of technical research and analysis starting with the first modelling exercise to project India's future HFC emissions under various policy scenarios, which estimates HFC emissions across various sectors until 2050. This was followed by studies to assess HFC mitigation potential and costs, including the commercial and safety aspects of alternative refrigerant technologies, all of which have helped to build consensus on the feasible pathways to an HFC phasedown. Shakti also enabled sustained stakeholder consultations that provided thought leadership and generated shared perspectives on the opportunities surrounding this transition. While the deliberations at Kigali were underway, a report supported by Shakti, *Informing decisions: HFC Phasedown in India* was showcased at a side event. The report highlighted India's stance at Kigali

Several efforts facilitated by Shakti have informed India's stance on the global phasedown of HFCs as well as led to a more informed policy discourse in the country.





and the costs associated with transitioning to lower global warming potential HFC alternatives.

Going forward, Shakti will help to shape a roadmap to implement the Kigali Amendment in India. Laying the groundwork for these efforts, a policy brief supported by Shakti suggests measures that can be taken for India to deliver on its commitments.

BRICK KILNS IN THE PATNA REGION GO CLEAN

In 2016, the Bihar State Pollution Control Board (BSPCB) issued a significant notification for the state's brick kiln industry—all brick kilns in the Patna district were directed to upgrade to cleaner technologies within the year, and new ones could only be set up using cleaner technology. Existing kilns in the rest of the state are expected to upgrade within the next three years. Several efforts facilitated by Shakti over a multi-year period helped lead to this notification, the most concrete measure taken by a state pollution control board to promote cleaner brick making technologies and to control air pollution from brick kilns.

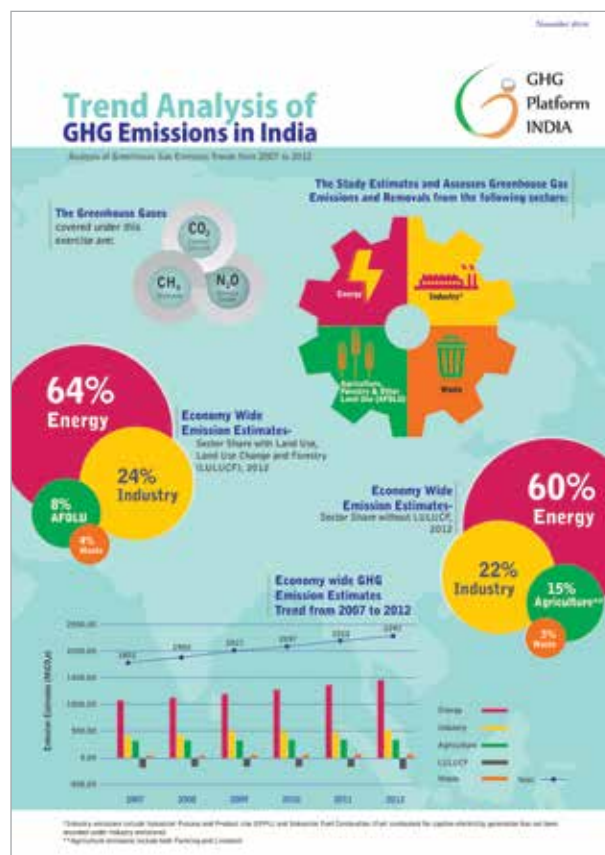
Building on this development, Shakti is now supporting targeted technical assistance to brick makers in the Patna district to comply with the notification. These efforts have helped shape the design of a sustained capacity building programme for brick entrepreneurs

and state officials to become more aware of cleaner technologies and for kilns owners to upgrade to their existing brick kilns. Shakti also supported the development of a detailed manual written by experts from the brick sector, designed to help brick entrepreneurs navigate the requirements of the notification.

Because of these efforts, almost half of all brick kilns in the Patna district have upgraded to cleaner technologies, promoting compliance with the BSPCB's order. Many of these kilns are already showing a 15% reduction in fuel consumption along with lower emissions. This is expected to improve in subsequent brick making seasons. A strong precedent has now been set for the BSPCB to pursue compliance of its notification in other parts of the state.

INDIA'S FIRST CIVIL SOCIETY PLATFORM PROVIDING DATA ON GHG EMISSIONS FOR VARIOUS SECTORS

In 2015, Shakti facilitated the establishment of the GHG Platform India, a collaborative platform of civil society organizations to prepare GHG emission estimates at the national level. The Platform aims to address a critical data gap—the lack of regular, reliable, and publicly accessible



The GHG Platform India is a significant step towards increasing transparency and increasing access to GHG emissions data for India.



annual GHG emission estimates for the country and individual states. It currently provides national emission estimates for major GHG emitting sectors in India—Energy, Industry Agriculture, Forestry and Other Land Use (AFOLU), and Waste sectors for the calendar years 2007 to 2012 for carbon dioxide, methane and nitrous oxide gases.

Now, the Platform is gearing up to publish national as well as state greenhouse gases (GHG) emission estimates for the years 2005 to 2013, as a follow up to its earlier effort. GHG emission estimates for every Indian state will also be published.

The GHG Platform India is a significant step towards increasing transparency and increasing access to GHG emissions data for India. The complete datasets with the emission estimates are available in the public domain (<http://www.ghgplatform-india.org>). GHG data available on the Platform can be used to track emissions, understand trends and inform energy and climate policy action, a relevant need in context of the commitments made by India under the Paris Agreement.

AN INDUSTRY-LED LEADERSHIP PLATFORM FOR DRIVING LOW-CARBON GROWTH

As India tackles the pressing issue of climate change, Indian businesses continue to turn to the India GHG Program for assistance to manage and reduce their GHG emissions. The Program has garnered the voluntary participation of roughly 50 businesses that collectively contribute to about 15% of India's total GHG emissions each year.

The pillars of the programme—institutional capacity building, internationally recognized and locally relevant GHG measurement and accounting tools, peer engagement, industry-specific benchmarking and best practices, and policy engagement—make it a center of

excellence on GHG management. With support from the Program, a majority of their member companies are now tracking and compiling their GHG inventories on a regular basis.

In 2016, the Program published a best practices road map for the Indian aviation sector to roll-out low carbon initiatives, a freight rationalization tool for large corporates and Public Sector Undertakings, Green Practice Case Studies for the Buildings and Heavy Engineering Sector and a draft Chlor-Alkali emissions mapping template. The Program has developed tools and resources for GHG accounting such as the do-it-yourself tool specially developed for SMEs and the power tool to estimate emissions from power plants. Other than making available easy-to-use tools, the Program has trained over 400 industry representatives through cluster trainings and in plant workshops across cities.

The Program was formally recognized in India's NDCs and the Biennial Update Report (BUR) that was submitted to the UNFCCC in 2016 providing the impetus required for better corporate GHG emissions management in India.

INDIA LAB LAUNCHES NEW GREEN FINANCE INSTRUMENTS

The India Innovation Lab for Green Finance continues to identify, develop and pilot transformative clean finance ideas and instruments to drive investment



for green infrastructure in India. In 2016, Loans4SME, one of the instruments selected in the Lab's first cycle, was launched with the aim of catalyzing cash-flow based loans for small businesses. Through strategic partnerships with over 50 lenders, Loans4SME has created pools of capital in excess of USD 100 million to provide loans ranging from USD 30,000 to USD 1 million to small businesses operating in renewable energy, cleantech, infrastructure and other high impact areas. Now in its second cycle, the Lab received 72 innovative idea submissions, of which the top four were selected based on their actionability, innovation, catalytic potential, and financial sustainability:

- **Solar Energy Investment Trusts (SEITs):** An investment trust to attract more capital at a lower cost to small-scale residential and industrial rooftop solar projects.
- **The Matchmaker Service:** A platform to match qualified investors with a pipeline of climate-related investment opportunities for cities in India.
- **Solar Agro-Processing Power Stations:** An enterprise to use solar off-grid systems for agro-processing in villages, to replace diesel-fueled mills or manual work by women.
- **Sustainable Energy Bonds:** These bonds aim to drive finance to sustainable energy projects by attracting impact investors looking for debt exposure and offering them a set of instruments that provides return as well as standardized impact measures.

Going forward, the Lab will help fast track these ideas by providing analytical support to shape them into actionable instruments or platforms.

The India Innovation Lab for Green Finance continues to identify, develop and pilot transformative clean finance ideas and instruments to drive investment for green infrastructure in India.



BETTER AIR QUALITY MANAGEMENT

Air pollution is a growing problem in urban areas. Around half of India's cities have extremely high levels of Particulate Matter (PM), with several cities also seeing an increase in other pollutants. The problem becomes more

complex due to the multiplicity of emission sources, such as industries, automobiles, generator sets, domestic fuel burning and construction activity as well as regional and seasonal differences. Shakti is enabling efforts to help improve air quality management in India.

In 2016, Shakti facilitated the installation of low-cost air quality monitors in 10 cities under 'Breathe', an independent air quality monitoring network which provides real time measurements on air quality. By bringing this data to the forefront, Shakti aims to address the information gap that exists regarding air quality in our cities. Now, citizens, have access to information on local air pollution levels, leading to increased public awareness. This data is also fostering transparency and accountability and is an important precursor for more informed policy action on controlling air pollution.

Research and stakeholder engagement enabled by Shakti has focused on a broad spectrum of solutions to control air pollution and protect public health in urban areas. Some of these include strengthening the legal framework for clean air in cities, monitoring air quality especially through low-cost devices, creating a city ranking tool, and creating a template for a clean air action plan for Delhi and surrounding areas. The analysis and "next-step" recommendations emerging from this research have helped inform a number of actions taken by the Government such as the development of a graded emergency response plan to tackle air pollution in New Delhi.

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HELPING STATES TO ACCESS CLIMATE FINANCE

States will play a key role in meeting the targets set under the NDCs. Many states have prepared State Action Plans on Climate Change (SAPCCs) and initiated other climate relevant measures. An enormous amount of funding is required to meet these goals, and states can access some of this funding from sources like centrally



sponsored schemes and dedicated domestic and international climate funds like the Green Climate Fund (GCF) and the Global Environment Facility (GEF). Now states must begin to identify various funding sources and target these sources based on their specific needs.

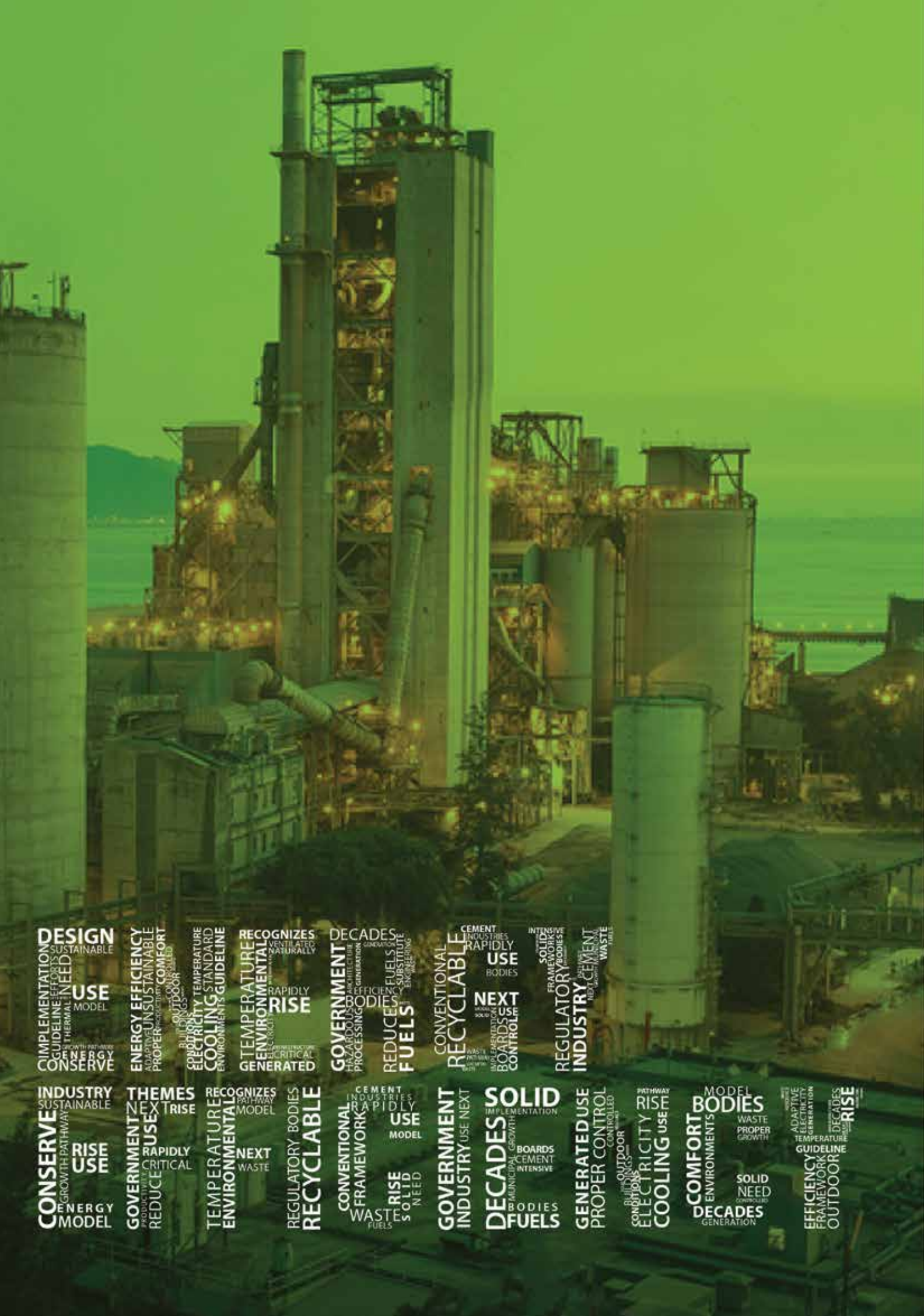
To this end, Shakti supported engagement and dialogue between stakeholders to bring focus to climate finance opportunities for states, and to identify ways for states to mobilize finance for specific sectoral activities. These efforts were undertaken in two states—Madhya Pradesh and Gujarat—bringing together several high-profile speakers from state-level agencies, the National Bank for Agriculture and Rural Development (NABARD), financial institutions and civil society.

Much groundwork was devoted to understanding the various sources of domestic and international climate finance sources along with their operational modalities. These efforts also drew on and actively channelled the experiences of NABARD, the National Implementing Entity (NIE) for the Adaptation Fund and the GCF, and the Accredited Entity (AE) for the National Adaptation Fund for Climate Change (NAFCC). An important outcome of these efforts is that it has helped state level officials to identify some potential interventions from their respective sectors which could be developed into funding proposals.

SUPPORTING THE IMPLEMENTATION OF THE NDCs

Shakti is supporting several efforts to inform the development of feasible pathways to meet the NDCs.

In 2016, a report commissioned by Shakti highlighted the state of India's preparedness to implement the Paris Agreement. The report provides an assessment of the challenges of meeting the NDCs and offers policy, regulatory and institutional solutions. It also serves as a useful reference point on policy dialogue on climate and energy action in India. With the discussions on the transparency regime under the Paris Agreement underway, Shakti is currently supporting efforts to evaluate the implications of the regime in India and identify ways to strengthen domestic institutional framework on Measurement, Reporting and Verification (MRV) of climate actions. Another study supported by Shakti is providing an inter-model comparison of different policy scenarios for the transport sector. Based on this analysis, policy recommendations will be proposed to reduce GHG emissions from the transport sector to support the NDCs. This study entails collaboration amongst four India modelling teams under the India-US Bilateral Energy Dialogue.



DESIGN
SUSTAINABLE
GUIDELINE
EFFORTS
THERMAL
NEED
USE
MODEL
CONSERVE
GROWTH
PATHWAY
ENERGY
MODEL

ENERGY EFFICIENCY
SUSTAINABLE
PROPER
COMFORT
BUILDINGS
OUTDOOR
TEMPERATURE
ELECTRICITY
STANDARD
COOLING
ENVIRONMENTAL
GUIDELINE

RECOGNIZES
VENTILATED
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GENERATION

India's energy demand is expected to double by 2030, and there is a pressing need to conserve energy and use it more efficiently. In line with this, the Government has launched aggressive energy efficiency efforts to help transition India to a more sustainable growth pathway. Shakti focuses on the design and implementation of policies that lead to greater efficiency in energy use in the industry, buildings and appliances sectors.

NOW, A THERMAL COMFORT STANDARD FOR BUILDINGS IN THE NATIONAL BUILDING CODE

Efforts supported by Shakti have led to the inclusion of the thermal comfort standard in India's National Building Code (2016), the national guideline for regulating building construction activities across the country. The trend has usually been to design air-conditioned office buildings that usually operate at 24°C throughout the year. Many of these buildings are sealed and fully controlled environments and do not take advantage of favourable outdoor conditions whenever available. This is unsustainable from an energy use point of view neither does it improve the overall comfort or productivity for building occupants.

Given this context, Shakti supported the design of an adaptive thermal comfort standard, one suited specifically for climatic conditions in India. The adaptive model recognizes that people's thermal comfort needs can vary with the outdoor environmental conditions of their location. Therefore, the standard provides design and operation guidance for air-conditioned as well as naturally ventilated buildings to operate within broader temperature bands. Suited to the Indian context, a broader comfort band can significantly reduce the use of energy intensive space cooling in buildings. It

Efforts supported by Shakti have led to the inclusion of the thermal comfort standard in India's National Building Code (2016), the national guideline for regulating building construction activities across the country.



is estimated that the proper implementation of this standard is likely to save up to 35% of cooling electricity in buildings.

The inclusion of the Thermal Comfort Model in the National Buildings Code comes at a critical time. The use of air conditioners is expected to rise rapidly in the next two decades. This will create more pressure on India's electricity infrastructure. With the National Building Code being an important reference point for guidelines on building construction activities in India, government bodies, construction agencies, builders, developers and academic institutions can refer to a standardized model that will reduce the energy use associated with space cooling in buildings.

COLLEGES TO INTEGRATE BUILDINGS EFFICIENCY CONTENT INTO ACADEMIC CURRICULA

Shakti is 'facilitating efforts to integrate building energy efficiency themes into the academic curriculum of engineering and architecture institutions. This is based on the premise that the next generation of building professionals must be better equipped to work in India's rapidly growing buildings sector. At present there is very little focus on including sustainably elements for buildings in existing academic curriculums.

In order to bridge this gap, Shakti has facilitated the development of educational curriculum, Training of Trainers (ToT) programmes for faculty members as well as certificate programmes for engineering and architecture students. In the last year, around 200 students and 79 faculty from 30 colleges across six cities were trained on elements of sustainable design, space cooling technologies and building energy codes.

As a result of these efforts, ten engineering and architecture institutions will officially integrate building energy efficiency themes into their academic curriculum. This knowledge will become a vital asset in building efficient homes and buildings for the immediate and long-term future.

A STEP CLOSER TO CO-PROCESSING IN CEMENT INDUSTRY A SOLUTION FOR WASTE TO ENERGY

Efforts supported by Shakti have contributed to the development of the draft guidelines for co-processing hazardous waste in cement plants. The draft guidelines were released by the Central Pollution Control Board in early 2017 to facilitate the process by which State

Pollution Control Boards (in states) and Pollution Control Committees (in Union Territories) can authorize co-processing in cement kilns in an environmentally sound manner.

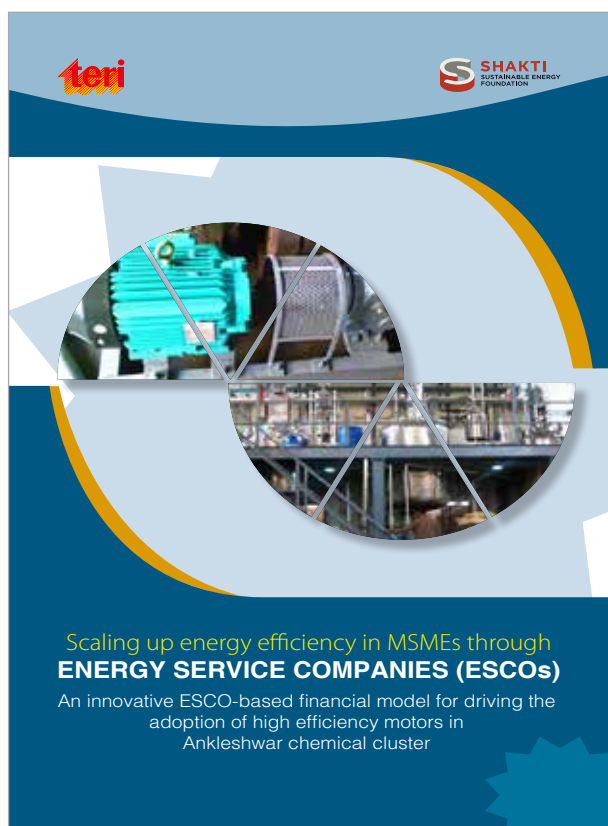
Co-processing is the use of waste as raw material, or as a source of energy, as a substitute to conventional fuels in energy intensive industries. The cement industry, one of the most energy intensive industries in the world, will strongly benefit from these guidelines. The potential for substitution is immense. Around 7.4 million tonnes of hazardous waste is annually generated in India of which around 3.98 million tonnes is easily recyclable. More than 62 million tonnes of Municipal Solid Waste (MSW) is generated from cities each year. This co-processing of this waste in energy- and resource-intensive industries can reduce the use of fossil fuels, dispose waste in a sustainable way and reduce GHG emissions from the cement industry.

Several efforts supported by Shakti over the last few years have laid the foundation for this measure. Studies supported by Shakti have provided several recommendations to increase co-processing levels in the cement industry, sourcing hazardous waste, developing waste inventories and forecasting waste. Shakti has helped to develop the regulatory and policy framework required for co-processing in the cement industry bringing together key stakeholders including pollution control boards and industry associations to build consensus on the issue. These efforts have contributed to the development of the draft guidelines.

SCALING UP ENERGY EFFICIENCY IN MSMEs THROUGH ENERGY SERVICE COMPANIES (ESCOs)

Electric motors account for 70% of overall electrical energy consumption in industries. But despite the availability of energy efficient motors in the Indian market, industrial units, particularly Micro, Small and Medium Enterprises (MSMEs) continue to use motors of lesser efficiency. This is largely due to the lack of information on the advantages of energy efficient motors or due to the lack of financing. The challenge is to overcome some of the barriers that prevent the market from being tapped. This is what Shakti set out to do when it supported a project to promote the adoption of more energy efficient motors among MSMEs in the Ankleshwar chemical industry cluster of Gujarat.

The Ankleshwar chemical industry contributes significantly to chemical production in Gujarat. The majority of units in this cluster are MSMEs using motors of standard efficiency. MSME entrepreneurs, industry associations and financial institutions operating in the



area were made aware on the energy saving and cost benefits of retrofitting the more energy efficient (IE3 standard or more) motors. Buoyed by the awareness campaign, several units showed interest in installing the energy efficient motors. Four local equipment suppliers then came forward to take on the role of Energy Service Companies (ESCOs). They would purchase and install the new motors at no upfront costs, and recover the investment from the MSMEs on deferred payment terms, based on the actual energy savings.

In the next few months, support was provided to these ESCOs to implement the project. Energy efficient motors were installed in six units and the ESCOs were provided assistance in developing energy performance contracts and verifying energy savings. As a result of these efforts, the average electricity savings achieved as a result is in the range of 4-7%. These are no mean saving and underscore the importance of ESCO-based models to promote energy efficiency motors across industries where low-efficiency electric motors and other end-use equipment account for a major share of electricity consumption.

SUPPORTING THE DESIGN AND IMPLEMENTATION OF THE PAT SCHEME

Shakti is engaging with key stakeholders to strengthen the design and implementation of India's Perform, Achieve and Trade (PAT) scheme, a key market-based mechanism aimed at enhancing industrial energy efficiency. The first phase of the PAT scheme ended in 2015 generating an optimistic response from Indian Industry. Efforts facilitated by Shakti led to the identification of new energy-intensive industrial sectors and a number of different industrial units within these to broaden the scope of the scheme.

Now, the second phase of the PAT is currently underway and there is an opportunity to include additional industrial sectors. Shakti is enabling efforts to assess the baseline energy consumption for new sectors such as petrochemicals and buildings (hotels) to identify their potential for energy efficiency. This assessment can help to inform the future development of the PAT scheme. An expanded PAT program will contribute to achievement of the NDC targets as the industrial sector, which consumes around 40% of the country's total commercial energy consumption.

Shakti is also enabling capacity building and outreach efforts to make stakeholders more aware of the processes and compliance modalities associated with the PAT scheme. Last year, several workshops were targeted at industrial units and State Designated Agencies in the eastern and northeastern parts of the country. The workshops helped to address the knowledge gap around energy auditing, energy management systems, technological innovations and the trading outlook for energy saving certificates. Shakti also supported the development of PAT Pulse, a quarterly update on PAT scheme.



Shakti is engaging with key stakeholders to strengthen the design and implementation of India's Perform, Achieve and Trade (PAT) scheme, a key market-based mechanism aimed at enhancing industrial energy efficiency.

A snapshot of Shakti's engagement at the state level: over the past few years

While overarching policy is made at the central level, implementation is effected at the state level. To this end, a significant focus on Shakti's work is at the state level.

CLEAN POWER

Rajasthan

- Feasibility analysis of solar irrigation pumps
- Implementation of a Demand Response pilot
- Direct benefit transfer for electricity subsidy

Gujarat

- DSM action plan
- RE resource potential assessment
- Scenario building for regulatory decisions on DSM and RE
- Capacity building of discoms

Maharashtra

- Capacity building of energy entrepreneurs and financial institutions for improving rural energy services
- RE market development

Karnataka

- Technical assistance to discoms for distribution reforms and DSM actions
- Capacity building of energy entrepreneurs and financial institutions for improving rural energy services
- RE resource potential and grid integration assessments
- RE market development

Andhra Pradesh

- RE resource potential and grid integration assessment
- Capacity building of energy entrepreneurs and financial institutions for improving rural energy services

Tamil Nadu, Puducherry

- Implementation of DSM approaches such as Standard offer Programme (SOP) targeting efficient lighting
- Development of a state DSM action plan and Demand Response program
- RE capacity deployment plan and market development

Delhi

- Development of a Demand Response program

Uttar Pradesh

- Support for state mini-grid policy, regulations and implementation frameworks
- Feasibility assessment of mini-grid's interconnectivity with the distribution grid
- Feasibility analysis of solar irrigation pumps
- Technical assistance to discoms for distributions reforms

Bihar

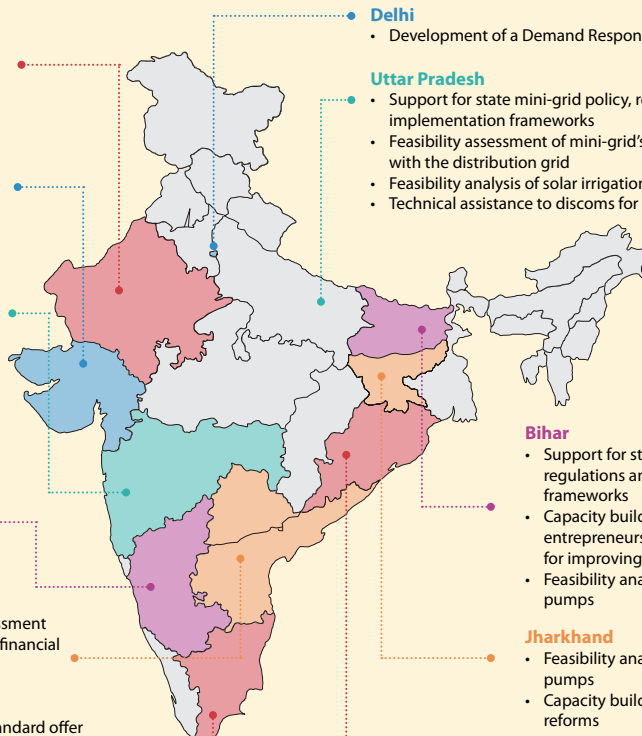
- Support for state mini-grid policy, regulations and implementation frameworks
- Capacity building of energy entrepreneurs and financial institutions for improving rural energy services
- Feasibility analysis of solar irrigation pumps

Jharkhand

- Feasibility analysis of solar irrigation pumps
- Capacity building of discoms for utility reforms

Odisha

- Support for state mini-grid policy, regulations and implementation frameworks



DSM: Demand Side Management
RE: Renewable Energy



SUSTAINABLE CITIES

Rajasthan

- Development of the Bus Rapid Transit System (BRTS) evaluation and design tool
- Technical assistance for the integration of sustainable transport elements in Smart Cities efforts
- Development of innovative financing mechanisms for sustainable transport projects

Gujarat

- Needs assessment for prioritizing sustainable urban transport
- Assistance for development of local area planning (LAP) methodologies

Maharashtra

- Development of bus terminal planning and design guidelines.

Karnataka

- Development of a roadmap for electric public transport
- Assistance on rationalising vehicle taxes for prioritising public transport
- Technical assistance to city bus operators on data management, finance and procurement

Tamil Nadu

- Development of a framework for promoting sustainable transport investments
- Development of a state urban transport policy (SUTP)

Delhi

- Multiple demonstration projects for improved accessibility and mobility through public transport and non-motorised transport
- Development of BRTS evaluation and design tools
- Development of transit oriented development (TOD) model

Madhya Pradesh

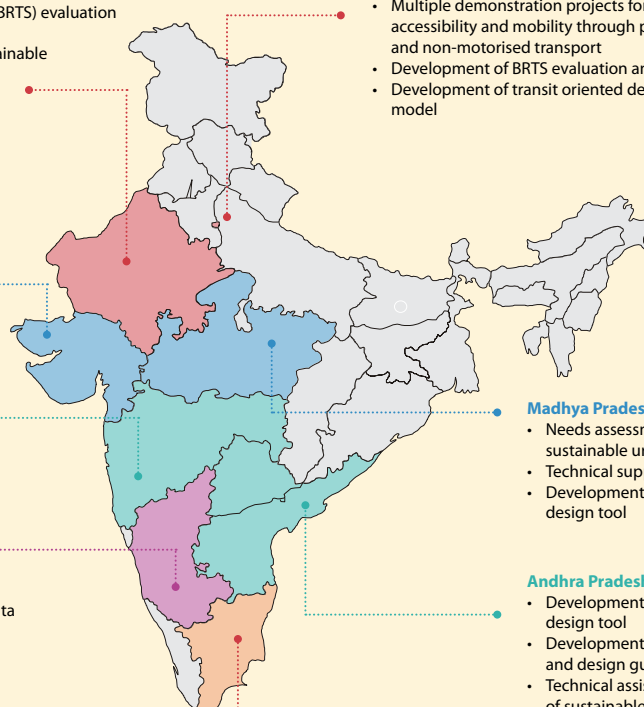
- Needs assessment for prioritizing sustainable urban transport
- Technical support for BRTS
- Development of BRTS evaluation and design tool

Andhra Pradesh

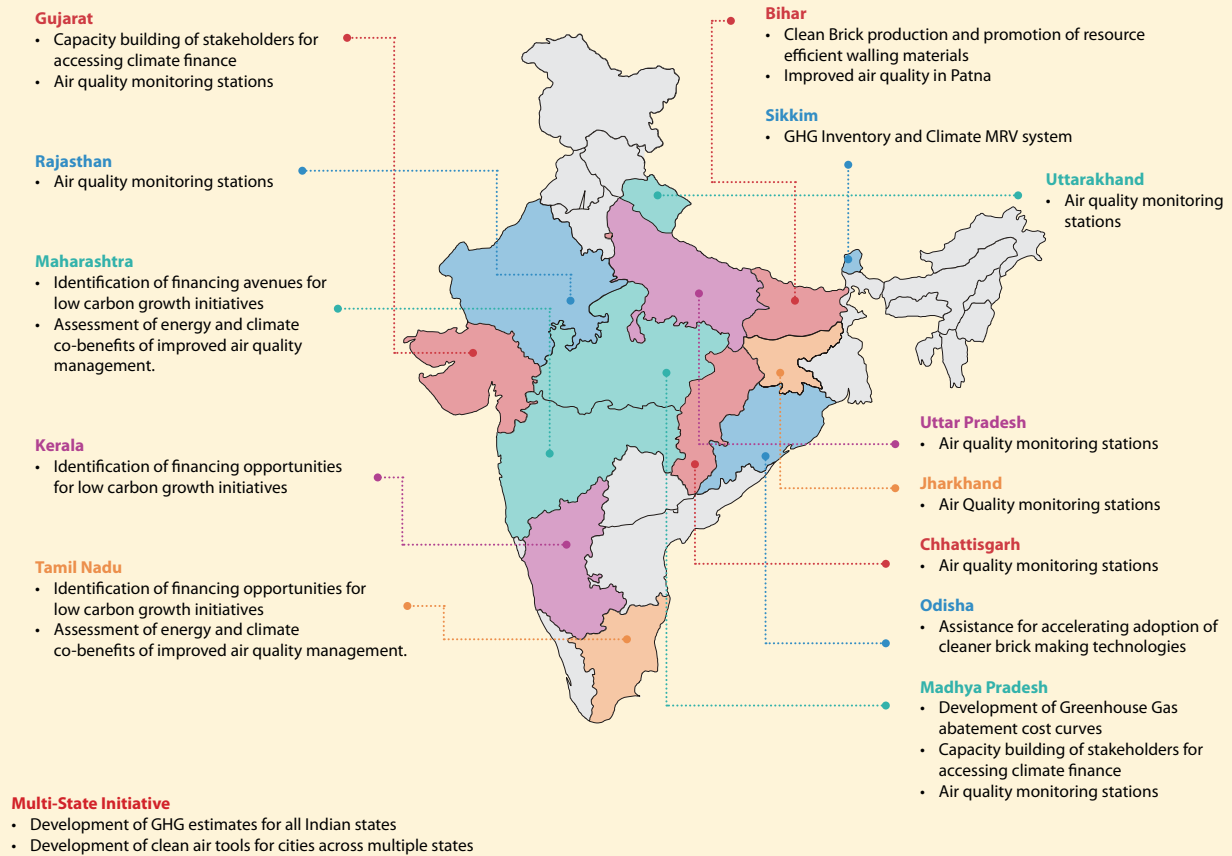
- Development of BRTS evaluation and design tool
- Development of bus terminal planning and design guidelines
- Technical assistance for the integration of sustainable transport elements in Smart Cities efforts

Multi-State Initiative

- Assessment of non motorized transport (NMT) infrastructure and policies.



LOW CARBON GROWTH



ENERGY EFFICIENCY

Rajasthan

- Development of Energy Conserving Building Codes (ECBC) implementation and compliance roadmap
- Technical assistance for integrating building efficiency in smart cities plan
- Capacity building of energy managers

Gujarat

- Development of ECBC implementation and compliance roadmap
- Development of Standards & Labeling (S&L) program implementation and enforcement strategies
- Roll out of communication and outreach strategy of promotion of S&L Program

Maharashtra

- Capacity building of energy managers and industry professionals
- Development of ECBC implementation and compliance roadmap
- Development of S&L program implementation and enforcement strategies
- District cooling systems potential assessment
- Energy efficiency in high rise residential buildings

Kerala

- Capacity building of energy managers
- Development of S&L program implementation and enforcement strategies
- Support of implementation of an EE technology lab
- Demand side energy conservation through behavioral change among residential consumers

Tamil Nadu

- Development of ECBC implementation roadmap
- Development of S&L program implementation and enforcement strategies
- Capacity building of energy managers

Delhi

- Development of ECBC compliance approaches
- Development of cool roofs design guidelines
- Sustainable, Smart, Space Cooling Coalition

Madhya Pradesh

- Capacity building of energy managers
- Development of ECBC implementation and compliance roadmap

Chhattisgarh

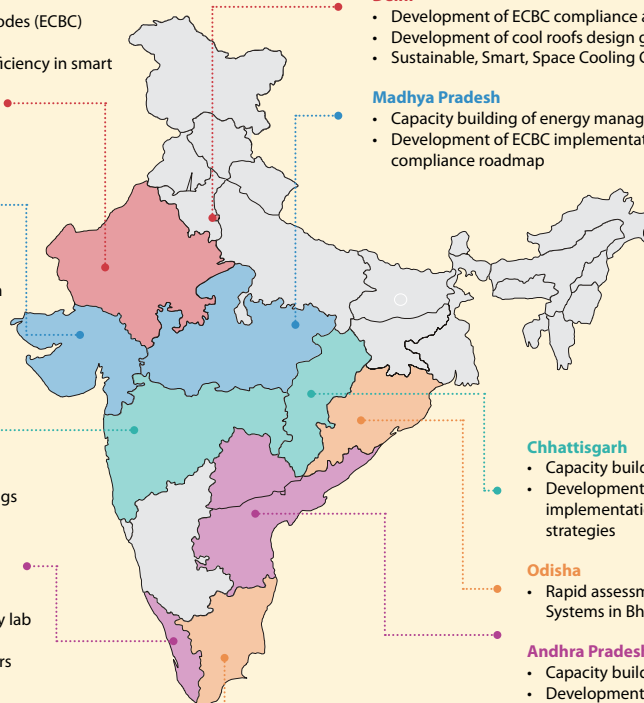
- Capacity building of energy managers
- Development of S&L program implementation and enforcement strategies

Odisha

- Rapid assessment of District Energy Systems in Bhubaneswar

Andhra Pradesh

- Capacity building of energy managers
- Development of S&L program implementation and enforcement strategies
- Technical assistance for integrating building efficiency in smart cities plan



The Shakti Dialogues 2017

The annual Shakti Dialogues held on March 22-24 in New Delhi focused on six important energy themes to support energy and climate action in India:

Energy Access | Space Cooling | Distribution Reforms
Clean Energy Finance | Smart Cities | Air Quality





The Dialogues convened key stakeholders to discuss the challenges and opportunities relevant to each theme. Subject matter experts from regulatory bodies, government agencies, civil society, academia, think tanks and industry participated. Shakti presented its programme strategies as a backdrop for each discussion, which drew valuable feedback to help inform our future work and stakeholder action. The convening also enabled stakeholders from

specific sectors to meet each other, understand different perspectives and to explore future collaboration.

Several sessions were chaired by distinguished members of Shakti's Board of Directors. The contributions and ideas emerging from the dialogues showed the reasons for increased optimism for India's energy future and the enormous potential for change.



Film 'Kadvi Hawa'

highlights the impact of climate change on the lives of ordinary people



In March 2016, Shakti and Eleeanora Images co-hosted a special screening of the unreleased film, Kadvi Hawa (Dark Wind) in New Delhi. With the impact of climate change becoming more apparent, this film by national award winning film director Nila Madhab Panda will help to raise awareness levels on this important issue.

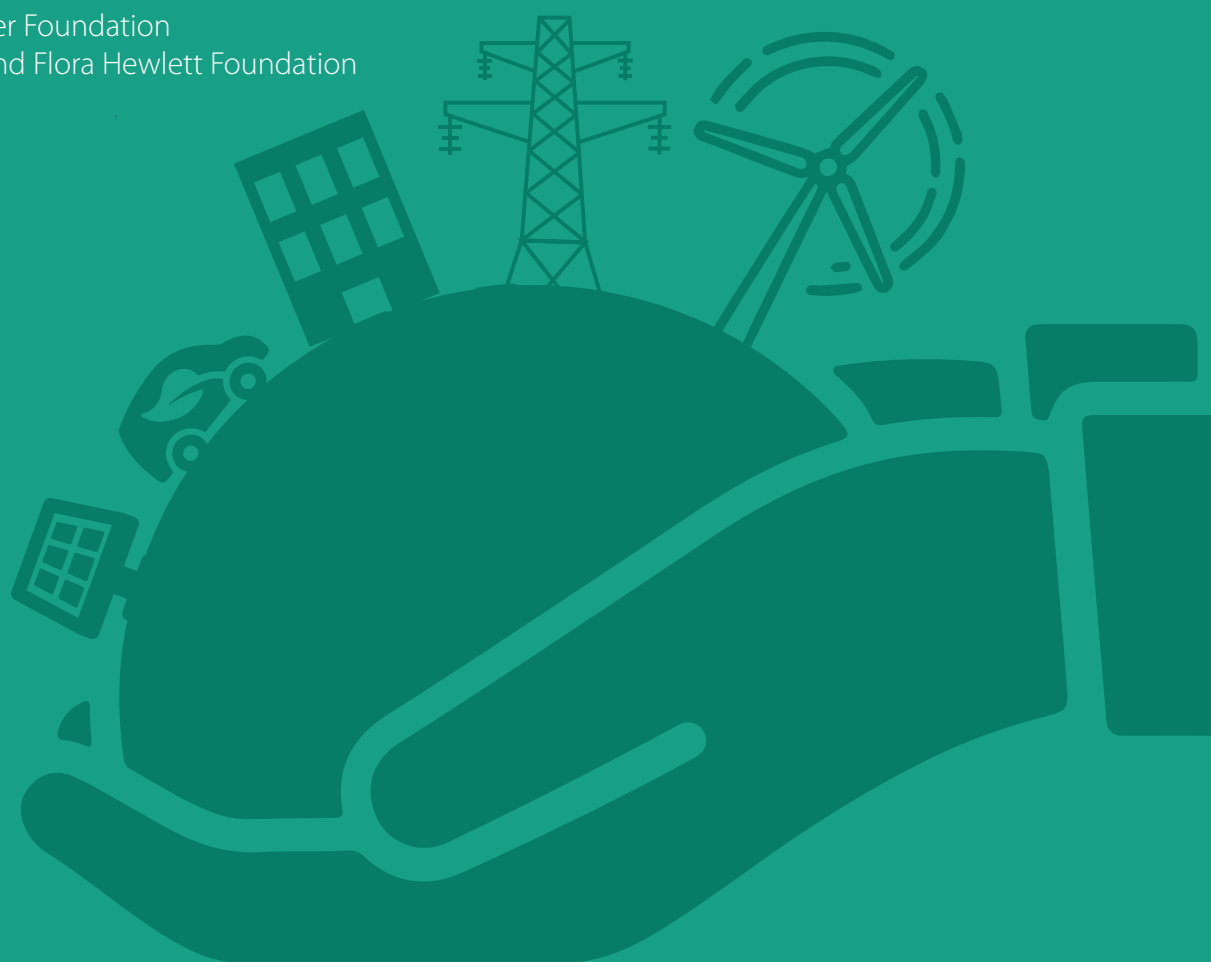
Kadvi Hawa is based on stories from the drought prone Bundelkhand region and the vanishing villages from coastal Odisha. It tells the story of a blind old farmer and a young bank loan recovery agent coming from two very different geographical areas with extreme climate conditions, and both fighting for their survival. Kadvi Hawa received a Special Mention at the 64th National Awards held in 2017.

Shakti is providing assistance towards outreach and engagement for this film to sensitize audiences on the impact of climate change on the lives of ordinary people.

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