

Rise to Shine

The role of Indian Religious Institutions in Closing the Energy
Access Gap

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Report Authors

The Bhumi Project is a leading international Hindu voice addressing issues related to climate change and sustainable development. It is a joint initiative of the Oxford Centre for Hindu Studies and the US-based non-profit GreenFaith.

GreenFaith is an interfaith environmental organisation. Their mission is to inspire, educate, organise, and mobilise people of diverse religious and spiritual backgrounds globally for environmental action. They are based in New Jersey, USA.

Shine is a global campaign dedicated to ending energy poverty and unlocking new opportunities for billions of people. Partners from the faith, development, and philanthropic sectors are mobilising new forms of capital, scaling resources, and generating momentum to achieve universal access to clean, affordable, and reliable energy by 2030 – a Sustainable Development Goal.

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Executive Summary

The climate crisis demands that the world move away from fossil fuels and adopt renewable energy solutions with unsurpassed speed and at unsurpassed scale.

To date, the Indian government has provided important leadership in adopting renewable energy solutions and moving away from fossil fuels. Its national commitment to installing 175 gigawatts of solar and wind energy by 2022 and its inception of the International Solar Alliance to mobilise technology and finance are two examples of how India is addressing this issue.

However, despite the Indian government announcing in April 2018 that every village in the country had been electrified, over 200 million people in India still lack access to electricity. This energy poverty has devastating impacts on community health, education, and economic growth. Cooking without clean energy inflicts severe respiratory illnesses on countless women and children, causing over 100,000 premature child deaths in India on an annual basis. Without reliable electricity, children cannot study after dark, vaccines cannot be stored, and jobs are not created.

In India, the issues of energy access and climate change are inextricably linked. If the 200 million people in India without access to electricity receive their energy from clean renewable sources, India will make a vital and positive contribution to the struggle against climate change. This report represents a first step in exploring how the country's large and diverse religious sector can play an important role in addressing these two interconnected challenges.

Indian religious and spiritual institutions command significant moral authority and have a large civil society presence. If engaged and equipped properly, they could play a transformative role in ending energy poverty in India. Their potential impact, however, has received very little sustained attention from regional and national governments, the renewable energy, energy access and social entrepreneur sectors, and funders.

Following a 2017 consultation in Mumbai between religious leaders and social entrepreneurs in the field of energy access, in 2018, the Bhumi Project and GreenFaith engaged EPG Consulting to conduct a modest, initial survey of the renewable energy efforts of Indian religious and spiritual institutions. The aim was to identify renewable energy efforts and trends in the Indian religious sector, to identify any involvement by Indian religious institutions in the area of energy access, and to determine further research and action steps in these areas.

Over a six month period we researched 30 Indian religious and spiritual institutions, distributed across the country, which had initiated some form of renewable energy and/or sustainability initiative. These institutions were from the Hindu, Islamic, Jain, Sikh and Christian communities, along with a number of non-denominational spiritual organisations. The stories we gathered offer insights on how one of Indian society's most culturally influential sectors can make a far greater contribution to closing India's energy access gap.

1. Summary of our findings

This report is a first-of-its-kind look at how Indian religious and spiritual institutions are implementing renewable energy solutions. Its key findings were as follows:

Models of excellence exist across the country. We identified a number of leading renewable energy projects across the country by major religious institutions. These models of best practice and leadership in the sector have been deployed by some of the largest and most respected religious institutions in the country.

Renewable energy systems can generate significant savings and displace the majority of religious institutions' fossil fuel use. The religious organisations which we studied regularly serve more than one million people combined. These organisations save approximately 332,000 kW of energy annually through their use of renewable energy, and have reduced their fossil fuel usage by more than 70%, reducing costs by approximately £1m annually.

Cost savings and reliability are prime motivators. Most institutions decided to install renewable energy systems to save money and to ensure a reliable, uninterrupted supply of energy. Environmental or spiritual/moral factors were not cited as a significant motivation.

On-site solar PV is the most common type of renewable energy solution. The majority of projects were on-site renewable energy installations that helped power the operations of the temple, mosque, church or gurudwara, or that powered the social and community programs that these institutions provide. Among various renewable energy technologies, solar photovoltaic (PV) systems was by far the most commonly utilised.

Renewable energy efforts at religious institutions are not networked; best practices are not shared. Almost without exception, the leaders of the 30 institutions had not spoken to each other or to other religious institutions about their efforts. We found no resources designed to share the successes of these institutions or to empower Indian religious institutions in adopting renewable energy solutions, nor any training or organised effort to support this process.

Willing to communicate, but need support. The institutions we researched were proud of their renewable energy installation, often for the technological prestige which they felt it conferred. They were eager to share the story of their efforts; most lacked the means or sophistication to do so.

Most Indian religious institutions have not yet considered how they might address energy access issues. Very few institutions had considered expanding the scope or ambition of their renewable energy efforts to include a focus on energy access for rural communities, and very few had established any relationship with social entrepreneurs or commercial enterprises in the renewable energy or energy access fields.

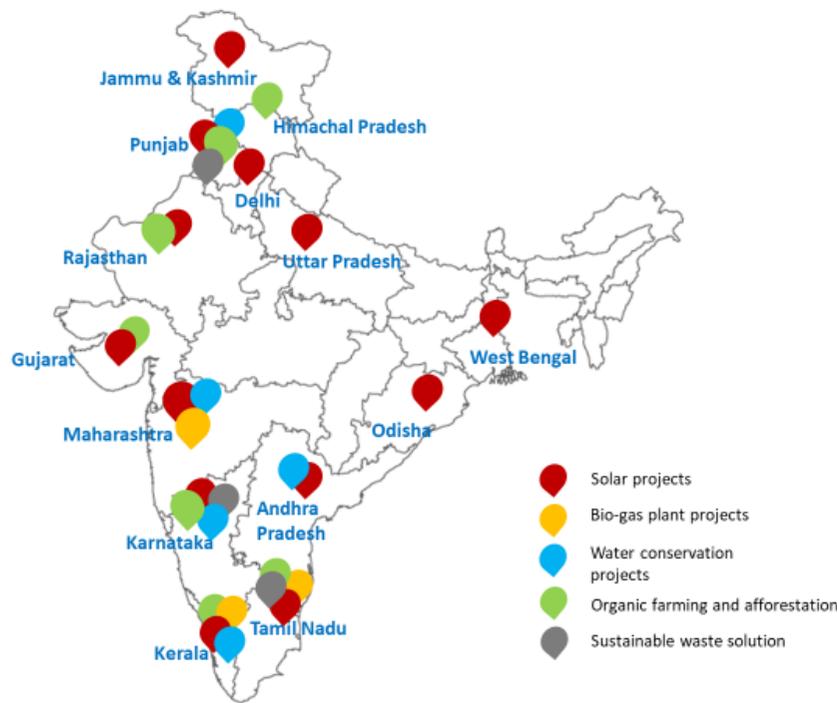
Financing models vary from institution to institution, with no model consistently in use and no mechanism to facilitate scaling. Some religious institutions relied on charitable or corporate contributions to cover some or all of the cost of their renewable energy system, while others relied on loans or organisational savings. There are no widely used financing mechanisms to accelerate the adoption of renewable energy solutions by Indian religious and spiritual institutions, nor is there guidance available about a spectrum of funding and financing options.

Energy access and renewable energy social entrepreneurs are not meaningfully connected to India's religious sector. At the 2017 Mumbai consultation, we found that none of the energy access or renewable energy entrepreneurs had an awareness of or strategic relationships with Indian religious networks, NGOs or leaders.

Indian religious leaders are not advocating for ambitious governmental renewable energy policies or for increased efforts to close India’s energy access gap. Due in part to low levels of awareness and education about climate change and the drivers of and solutions to energy poverty, Indian religious leaders are very early in the process of developing a commitment to public advocacy suitable for the Indian context on these issues.

In conclusion, our findings indicate that India’s large and diverse religious sector is at the early stages of adopting renewable energy, and at an even more preliminary stage of addressing energy access issues and advocating for ambitious responses to the climate and energy access crises. The size and influence of this sector means that it has the potential to make an important contribution on these issues in India. However, important work remains to be undertaken.

1. Map of India summarising locations of energy access, and related, projects outlined in this report



Source: EPG.

The following table provides a summary of the institutions that we spoke to. Where possible, we have tried to highlight where they may be able to engage with the SHINE campaign.

2. Summary of energy access and related work in the religious community

Organization	Religion	Green Measures	Year began	Cost (US\$m)	Key projects	Impact		
						Description	Visitors/ people impacted (daily)	Energy savings (annually)
Ahinsa Sthal	Jainism	Installation of solar panels on temple building	2017	-	Solar panel installation in temple premises	Replaces more than 35% of temple's electricity consumption, helps save close to US\$750/year, exports 25% of solar energy back to the grid in exchange of solar credits and reduces future electricity bills	-	8.7 MWh
Akshaya Patra Foundation	Spiritual	New Belgian technology system to convert organic waste to biogas and, in turn, electricity; effluent treatment plants; solar plants; high efficiency reverse osmosis systems; briquette-based boilers	-	-	Solar plant in Vasanthpura kitchen; considering the introduction of effluent management plants across 34 kitchens, (12 states)	Aims at using solar power to reduce the kitchen's dependency on grid electricity and provide protection from power failures and fluctuations. The effluent treatment plants help with efficient handling and recycling of solid wastes and waste water	1,600,000	1100 kWh
Ambar Mosque	Islam	Lucknow's only all women mosque with solar power installation that is an on-grid system which doesn't require batteries	2017	0.0018	Solar panel system on the rooftop of the mosque	Aims at using solar power to reduce dependence on electricity produced from highly polluting sources such as coal. The excess energy is fed back to the grid to help earn solar credits that can offset the electricity bill. 70% annual saving on electricity expenditure	-	1ton Co2
Auroville Foundation	Spiritual	Develop sustainable urban development policies, eco-friendly technologies and solarise atleast 100 villages across Tamil Nadu	2015	0.46	Solar Village initiative	Solar Village Initiative proposes to install Solar PV systems in villages and hamlets of Villupuram District, Tamil Nadu. Aims to provide clean, reliable and affordable electricity to the villages and also help with employment generation	105,000	-
Badriya Juma Masjid	Islam	Reconstruction of the world's first eco-friendly mosque on an ancestral property, incorporating green and energy efficient technologies in the mosques design	2013	0.3	World's first zero energy, eco-friendly green mosque	Uses hybrid and renewable forms of energy for the entire power supply, allows 88% less power consumption, building architecture allows maximum ventilation and naturally cooling environment	2,000	-
Brahma Kumaris	Spiritual	Research on solar cooking systems; thermal storage and thermal power generation; PV stand-alone systems; solar hot water plants; yogic agriculture project	1999	1.30	India One	Uses 770 newly developed 60 sqm parabolic dishes and features thermal storage for 16 hours continuous operations for base load	25,000	-

Organization	Religion	Green Measures	Year began	Cost (US\$m)	Key projects	Impact		
						Description	Visitors/ people impacted (daily)	Energy savings (annually)
Chinmaya Mission	Spiritual	Sustainable farming; modern training methods for farming; water resource conservation; water shed development and biological nitrogen fixation; redesigned Paramdham Campus into green building	2003	-	CORD initiated in Himachal Pradesh but now in other states too	Facilitated over 400 organic manure production units across Himachal Pradesh	500,000	-
EcoAmritsar	Sikhism	Afforestation projects; Green Gurdwara project; Green Nagar Kirtan; renewable energy; water conservation; waste reduction and recycling; awareness workshops on nontoxic natural farming and waste disposal	2012	-	Green Gurdwaras	Grassroots movement led by gurdwaras that choose to reduce their impact on their environment through new ideas on renewable energy; water conservation	-	-
Embracing the World, Sri Mata Amritanandamayi Devi (AMMA)	Spiritual	GreenFriends environment campaign; The Plastic Project working towards plastic recycling campaign; rain water harvesting; organic cultivation; afforestation	2001	-	The Plastic Project	Teaches simple techniques to recycle plastic packaging into retail products. Recycling center in Amritapuri serves as educational model of professional waste management	-	-
Golden Temple	Sikhism	Harnessing of solar energy for the lighting, installation of solar water heaters and waste management; distribution of saplings to temple visitors as an initiative to increase green cover	2017	0.23	Solar power system in temple premises	The solar energy system installed in 2017 significantly reduced daily consumption of fuel	100,000	600 LPG cylinders; 30,000 kgs firewood in community kitchen
Golden Temple of Sripuram	Hinduism	Solid waste management, wastewater management, biogas generation, harnessing of solar energy	-	-	Bio gas plant and solar water heaters	Bio gas plant produces 50 kgs. of biogas daily for cooking; temple has solar heaters generating hot water for kitchens	5,000	Conventional fuel usage down 80%
Isha Foundation	Spiritual	Promote hands-on environmental education; increase green cover; Vanashree Eco Center; urban greening campaigns; corrective measures to increase green cover and restore soil health	2002	-	GreenHands Initiative, Tamil Nadu	Mass tree planting marathon (2006) with 250,000+ volunteers resulted in 852,587 saplings planted in one state in a day, setting a Guinness World Record. 2007 and 2008 tree planting campaigns led to plantation of 7.1 million of saplings	-	-
ISKCON	Hinduism	Harness solar power to cook meals for devotees; development of Govardhan eco-villages around the world and installation of an innovative on-site waste management system	2003	-	Innovative on-site sustainable waste solution called Cabonlites in a Box, Bangalore, for food and cow waste	The system processes one ton of the temple food waste on daily basis, produces 0.04 tons equivalent of Carbonlites per day which are purified of impurities and piped into temple kitchen, where it displaces LPG for cooking	10,791	Lower tipping fees, LPG costs, carbon emissions

Organization	Religion	Green Measures	Year began	Cost (US\$m)	Key projects	Impact		
						Description	Visitors/ people impacted (daily)	Energy savings (annually)
Jagannath Temple	Hinduism	Installation of solar panels on temple building	2011	0.08	Solar panel installation in temple premises	The temple's 30kW solar power facility allows almost 30% of their daily power consumption	10,000	8,640 kW
Jama Masjid	Islam	Third mosque in Mumbai after Minara Masjid and Zakaria Masjid, to switch to solar energy and install solar panels	2017	-	Solar panel installation on the rooftop of the mosque to power lights, fans and air conditioners of the common areas	The mosque's 31 kW solar project helps account for over 70% of its annual energy requirements and allows 67% cost saving on monthly electricity bills	-	45,700 kWh, 35 tons of Co2
Lotus Temple	Hinduism	Solar panels for lighting and cooling	2015	-	Solar panel installation in the temple premises	The solar plant helps the temple manage a quarter of their annual power requirement. Their Grid Tie system supported by a net meter allows cost savings and forms a good reserve. Around US\$ 27,000/year saved	10,000	11400 kW, 120 tons of Co2
Madrasa-e-Mohammadiya	Islam	Fourth mosque in Mumbai after Minara Masjid, Zakaria Masjid and Juma Masjid to switch to solar energy and install solar panels	2018	0.01	Rooftop solar system	The mosque's 9 kW solar project allows 75% cost saving on monthly electricity bills	-	12,775 kWh, 18 tons of Co2
Manas Mandir	Jainism	Installation of solar panels on the temple building	2017	0.06	Solar panel installation in temple premises	The installed system has the capacity of generating around 145,000 units on an annual basis and meets 40% of the energy requirements of the temple. It has helped save around US\$ 22,500/year	-	145,000 units
Minara Masjid Mosque	Islam	First mosque in Mumbai to switch to solar energy and install solar panels	2017	0.018	Solar panel installation on the rooftop of the mosque to power lights, fans and air conditioners of the common areas	The installed system with 46 solar panels generates about 45 kWh to 70 kWh solar power per day. It helps save around US\$ 4,800/year	-	21,200 kWh
Seva Kendra Calcutta	Christianity	Focuses on raising awareness on climate change issues and building financial independence amongst tribal women	2014	-	Natural resource management project	Training session on usage and benefits of solar lanterns, setting up of solar panels and night lights in tribal villages of West Midnapore District in West Bengal	-	-
Radha Soami Satsang Beas	Spiritual	Installation of solar panels on the organisation's rooftop space	2015	21	World's largest single rooftop solar plant spread across 0.3 sq. km area	Has the capacity to generate electricity to cater to the needs of 8,000 households annually and abate 400,000 ton Co2 by 2040	-	15 million units, 19,000 tons Co2

Organization	Religion	Green Measures	Year began	Cost (US\$m)	Key projects	Impact		
						Description	Visitors/ people impacted (daily)	Energy savings (annually)
Sheth Motisha Jain Temple	Jainism	Installation of solar panels on the temple building	2017	0.04	Solar panel installation in temple premises helps power the lights and fans of their pathways around the temple, guest accommodations for devotees, store rooms and dining area.	The temple's 37.5 kW power rooftop solar system with 115 panels helps save around US\$ 12,000/year	-	58,400 kWh
Shree Ayyappa Temple	Hinduism	Installation of solar panels on the temple building	2017	0.014	Solar panel installation in the temple premises	41-panel rooftop solar power plant. US\$ 4,000/year saved	-	19,700 kW 17.72 tons of Co2
Shri Mata Vaishno Devi Shrine Board	Hinduism	Use of eco-friendly woven bags to reduce plastic usage, installation of waterless urinals, setting up of sewage treatment plants, use of energy efficient LED lights, inauguration of solar plant at Solar Power Plant at Shri Mata Vaishno Katra Railway Station.	2014	1.3	Biggest solar rooftop plant in Jammu and Kashmir	1 MWp Solar Plant was constructed at Shri Mata Vaishno Devi Katra Railway Station which generates 5,000 units daily saving about US\$ 150,000/year	21,160	10,000 tons of Co2
Sri Sai Baba Temple	Hinduism	Harnessing solar power to cook meals for devotees and lighting up the premises; installation of energy pedals	2009	0.20	Solar parabolic concentrated system	Generates about 3500 kg of steam daily allowing cooking food for their daily visitors. Unique system of converting walking energy of devotees into power through installation of energy pedals. More than US\$30,000/ year saved	20,000	100,000 kg of cooking gas
St. Michael's Church	Christianity	Incorporated six environmental initiatives in its activities like installation of solar panels, solar water heaters, energy efficient lights and fans, composting of organic waste, biogas from flower waste, and greening the church area	2014	0.0004	Bio gas plant that converts flower waste into fuel and solar panel installation	The bio gas plant converts more than 500 tons of flowers into five gas cylinder worth of fuel annually. Has constructed 20 kWh solar grid that helps lower monthly electricity bill by US\$ 360. Has inspired four other institutions in their neighbourhood to set up solar systems. Together all four helped produce 215 MWh, reduce 162 tons and save US\$ 39,000/year	-	15 tons of Co2
Swaminarayan Akshardham Mandir	Hinduism	Harnessing solar power to cook meals for devotees	2012	0.32	Solar parabolic concentrated system, converting solar into steam	Their large solar parabolic system has capacity to save 30-50 Nm3 natural gas/day. Technology caters to cooking energy needs of up to 4,000 people	-	-

Organization	Religion	Green Measures	Year began	Cost (US\$m)	Key projects	Impact		
						Description	Visitors/ people impacted (daily)	Energy savings (annually)
The Art of Living	Spiritual	Solar lighting solution, distribution of solar lights and installation of solar microgrids, solar plant engineering and entrepreneurship training	2010	-	Light a Home campaign, Rajasthan	Distributed 15,000 solar lights in tribal areas across India, lit up 16,500 homes, created 98 solar entrepreneurs and 1,300 solar engineers across India	65,000	-
Tirumala Temple, Tirupati	Hinduism	Installation of the world's first largest solar cooking system; replacement of halogen street lights with LED street lights; plastic recycling; afforestation and conservation of water through their Haritha Project; installation of wind turbine.	2002	0.17	Solar cooking technology	Solar cooking system has helped save nearly Rs.2 million (US\$ 30,000) annually. Identified as a future 'low-carbon footprint city' by European Commission	50-100,000	48,000 gallons of diesel 438 tons of Co2

Source: EPG.

2. Energy access initiatives at leading religious institutions

This section outlines examples of energy access initiatives at leading religious institutions in India as well as outside. It is based on our desk research as well as interviews with key stakeholders.

For many of these initiatives, per the revised tax exemption act effective 1st April 2017, Section 80G of the Income Tax Act provides a 50% tax exemption for Indian citizens and Non-Resident Indians, for donations of Rs 500 or more.

Christian Institutions

St. Michael's Church, Maharashtra

Overview: Built in 1534, St. Michael's is one of the oldest Catholic Portuguese Franciscan churches in Mumbai. The church has successfully incorporated six environmental initiatives in its activities, including the installation of solar panels, solar water heaters, energy efficient lights and fans, composting of organic waste, biogas from flower waste, and greening the church area. The church became the first and only church in Mumbai to install a biogas plant. Through these activities the church has helped educational institutions, housing societies and other churches in their neighbourhood to move a step towards incorporating sustainability measures by setting up solar, rainwater and compost systems to reduce energy, water and waste. Collectively, St. Michael's Church and these institutions produce 215 MWh of electricity per year, saving about Rs.2.6 million (US\$ 39,000) and avoiding 162 tons of Co2 emissions.¹

Description: St. Michael's Church in Mumbai is the first in Mumbai to have a biogas plant that converts flower waste to fuel. In a week the church receives around 100 kg of flowers from which they create bio gas which can be used for cooking food for three hours. The church set up a 1,000-litre/one cubic metre water tank incurring a cost of around Rs. 25,000 (around US\$380) on the terrace of the church where they store the flowers and decompose them in the absence of oxygen to generate biogas. The gas generated out of the decomposing waste is collected into a 500-litre gas tank positioned above the flower tank, which is eventually used as fuel in the church's kitchen. In a year, the plant converts more than five tons of flower waste into around five gas cylinder worth of fuel.² The church has also installed a 20 kWh solar grid that helps the church lower its electricity bill by Rs.24,000 (about US\$ 360) a month and reduce its carbon footprint by 15 tons a year.³

Seva Kendra Calcutta, West Bengal

Overview: Seva Kendra Calcutta is a social service center of the Archdiocese of Kolkata that has been working towards the upliftment of disadvantaged people in West Bengal and running various environmental projects for promoting organic cultivation, developing and promoting solar and renewable energy and harnessing natural resources.

Description: Natural Resource Management project is one of the key initiatives of Seva Kendra Calcutta that focuses on raising awareness on climate change issues and building financial independence amongst tribal women. The project started in 2014 and has been operational in 20 of the most backward tribal villages of west Midnapore in West Bengal. It trains tribal women in assembling, repairing, maintaining and selling solar lanterns and ensures the complete benefit of

¹ <https://www.hindustantimes.com/mumbai-news/mumbai-s-mahim-church-says-amen-to-clean-energy/story-EwB9GUPcbMBBILMIhXj68K.html>, accessed October 17, 2018.

² <https://www.mumbailive.com/en/civic/mahim-church-produced-bio-gas-out-of-waste-flowers-11352>, accessed October 17, 2018.

³ <https://www.hindustantimes.com/mumbai-news/mumbai-s-mahim-church-says-amen-to-clean-energy/story-EwB9GUPcbMBBILMIhXj68K.html>, accessed October 17, 2018.

these entrepreneurship activities reach them directly. Seva Kendra Calcutta has conducted training sessions on usage and benefits of solar lanterns at Yangon, Myanmar, and enabled the local women to become trainers at the sessions.

As a part of the Natural Resource Management project, Seva Kendra Calcutta has also installed rooftop solar plants and standalone nightlight solar panel around the educational institution and hostels set up by them in west Midnapore. The Seva Kendra office building in Kolkata itself has a 33 kW rooftop solar plant equipped with net metering facility, connected to the Calcutta electric supply corporation grid. In Q4 2018, the organisation plans to launch a training course on 'Community Managed Disaster Risk Reduction' and climate change and is also hoping to host a climate change conference in Kolkata inviting spiritual and religious leaders across major religious institutions.⁴

Hindu Institutions

Golden Temple of Sripuram, Vellore, Tamil Nadu

Overview: The Golden Temple of Sripuram, also known as Sri Lakshmi Narayani Golden Temple, was built in 2007 and is the largest golden temple in the world with over 1.5 tons of gold used.⁵ Their green measures include solid waste management, wastewater management, biogas generation and harnessing of solar energy.

Description: The Golden Temple has a daily footfall of over 5,000 which translates into two tons of waste, both biodegradable and recyclable. The temple has a zero-waste management policy that includes a biogas plant and a waste processing facility. Their compost is used as fertilizers on the temple ground or sold with recyclables for Rs.100,000 (about US\$ 1,500). Their waste water is recycled and used to irrigate plantations, mostly vegetables that are grown internally for meals. The temple also has a rain water harvesting system and a small organic farming area the residents have created.

The *gaushala* (cow-shed) maintained by the temple management generates three tons of cow dung as a raw material for their biogas plant. The bio gas plant produces 0.05 ton of biogas daily which is used for cooking. The temple also has solar heaters that generate hot water for the kitchens, reducing the need for conventional fuel by 80%.⁶

International Society for Krishna Consciousness (ISKCON), across India

Overview: Their green measures include ISKCON Rural Development project that provides villagers with common-lift irrigation systems, agricultural training, warehousing, and marketing facilities. They also work towards harnessing solar power to cook meals for devotees, development of eco-villages around the world and installation of on-site waste management systems.

Description: ISKCON's projects such as Prayag and ISKCON Rural Development strategically aim at rural development in the fields of health, sustainability and economy. Project Prayag, structured under three umbrellas Ganga, Yamuna and Saraswati, has pioneered several villages in Maharashtra in order to build a self-sustaining economy. They aim to reach out to 500 villages to ensure agro-based economic development, cow protection and breed preservation, seed preservation and water conservation, building solid spiritual foundation and conducting general health check-up camps and providing affordable health care to the rural poor as well.⁷

⁴ <http://www.sevakendra.in>, accessed October 17, 2018.

⁵ <http://www.indianmirror.com/temples/sripuram-golden-temple.html>, accessed October 17, 2018.

⁶ Balachander, J. (2015), Green Temples Guide, p.22.

⁷ http://www.business-standard.com/article/pti-stories/iskcon-aims-at-rural-uplift-through-project-prayag-115053100463_1.html, accessed October 17, 2018.

The ISKCON Rural Development project functional in Nasrapur (two hours from Mumbai) provides villagers with common-lift irrigation systems, agricultural training, warehousing, and marketing facilities.⁸ ISKCON Daiva Varnasrama Ministry (promoting rural development in India) has a course in organic farming that incorporates vedic teachings on organic farming, promotes education on the negative effects of chemical fertilizers.⁹

ISKCON also has 65 farms or eco-villages around the world, including Krishna Valley in Hungary, which is fully self-sufficient in vegetables and fruit and has their own waste water management system and solar panels that cover 70% of their electricity needs.¹⁰

ISKCON's self-sustained farm community, Govardhan Eco-Village, situated in the north of Mumbai, practices organic farming, green building, and water conservation, produces clean, renewable energy that powers the entire village with solar panels and bio-gas. The village is a classic example of adopting rural specific energy sources to reduce carbon foot print. There is a 30-cubic meter model biogas plant, which runs on cow dung and other food waste. The gas produced from this plant is directly used as a fuel for cooking, minimizing their need for LPG. The village also houses a 30 Kilo Volt Ampere (kVA) solar power plant and many stand-alone solar-powered street lights. The eco-village also has various Animal Driven Prime Movers (ADPMs) which consists of a step-up gear box connected to a level, driven by a pair of bullocks. This is an excellent alternative for common electro-mechanical devices to generate power using animal energy. It houses a bull-driven water pump, bull-driven grass cutting machine and various bullock carts for transportation. The bulls are worked in turns, engaging them on alternate days, thus harnessing useful clean power and ensuring the wellbeing and quality care of the animals.¹¹ In 2017, Govardhan Eco-Village won the 'Green Platinum Award' by IGBC.¹²

British company Carbon Masters helped ISKCON Bangalore install an innovative on-site waste solution called Carbonlites in a Box. It is a fully functional portable biogas plant built within 2 x 40 ft reused shipping containers, one on top of the other. It processes one ton of the temple's food waste on a daily basis and produces 0.04 tons equivalent of Carbonlites (a renewable natural gas that burns longer than alternatives such as LPG and is 100% carbon neutral to use) daily, which is purified of impurities and piped directly into the temple kitchen, where it displaces LPG for cooking. It provides a sustainable solution for the temple's food and cow waste, saving rising tipping fees (charge paid to the owner of a waste processing facility or a landfill to collect a certain quantity of waste for disposal), and LPG costs as well as reducing the temple's carbon emissions.¹³

Jagannath Temple, Odisha

Overview: The Jagannath Temple in Puri, Odisha is one of the four great Char Dhaam (the four pilgrimage sites in India that are revered by Hindus) other than Rameswaram, Badrinath and Dwarka. The temple's green measures include installation of solar panels on the temple building.

Description: In 2011, the Indian government's Ministry of New and Renewable Energy (MNRE) sanctioned Rs.5 million (about US\$ 75,000) for installation of solar power system to convert the lighting system in Sri Jagannath Temple into

⁸ <http://back2godhead.com/iskcon-rural-development/>, accessed October 17, 2018.

⁹ <http://www.iskconvarnasrama.com/home/activities-2/donate/organic-farming/>, accessed October 17, 2018.

¹⁰ <https://iskconnews.org/iskcon-can-play-a-part-in-reducing-climate-change.5274>, accessed October 17, 2018.

¹¹ <https://ecovillage.org.in/alternate-energy/>, accessed October 17, 2018.

¹² <http://indianexpress.com/article/india/iskcons-govardhan-eco-village-gets-green-platinum-award-4896292/>, accessed October 17, 2018.

¹³ <http://carbonmasters.co.uk/carbonlites-in-a-box-sucessfully-installed-in-the-iskcon-temple-in-bangalore/>, accessed October 17, 2018.

solar power.¹⁴ In 2012, a Kolkata-based solar module-making firm was given a contract to install a 30kW solar power facility on the temple premises. The project was a part of the initiative of Odisha Renewable Energy Development Authority (OREDA) and helped reduce the temple's dependence on grid power. The temple's annual consumption was 28,800kW of which the project allowed almost 30% to comprise of solar power.¹⁵

Lotus Temple, Delhi

Overview: The Lotus temple in Delhi was constructed in 1986 and is known to the world for its flamboyant architecture of a lotus flower with its petals half opened. The temple's green measures include the use of solar panels for lighting and cooling.

Description: The temple has installed more than 400 PV panels, that produce 0.1 MW power. The power so generated is used for lighting and even cooking purposes. Tata Power Solar, India's largest integrated solar company, commissioned the 120 Kilowatt peak (kWp)¹⁶ solar plant at the temple in 2015. This enabled the temple to take their first step towards going green and using clean energy for their daily power needs. The solar plant helps the temple manage a quarter of their annual power requirement of 45,600 units through solar energy saving around Rs.1.8 million (about US\$ 27,000) in annual energy bills, while also saving nearly 120 tons of Co2.

The project comprises a Grid Tie system¹⁷ supported by a net meter, which allows for excess power generated to be fed back to the grid. This is especially beneficial on days when the temple is closed. This made the temple the first in Delhi to be a part of the Delhi Electricity Regulatory Commission's (DERC) 'Net Metering' regulations notified in 2014.^{18,19} After the Lotus Temple, 11 schools of Delhi like Tagore International, New Era Public School, amongst others, opted the net metering connection from power distribution licensee BSES Rajdhani Power Limited (BRPL)²⁰. Till March 2017, BRPL had 272 net metering installations across South and West Delhi.²¹

Shree Ayyappa Temple, Maharashtra

Overview: The Shree Ayyappa temple is the first in Mumbai suburb to tap solar energy for its domestic use. Their green measures include installation of solar panels on the temple building.

Description: In 2017, Shree Ayyappa Temple installed a 41-panel rooftop solar power plant across 110 sqm that generates 19,700 kWh of electricity annually or 54 kWh electricity daily. With a capacity of 12.71 kWp, the plant can supply all the electricity the temple needs in a year and expects to save Rs. 260,000 (about US\$ 4,000) every year. The

¹⁴ <https://www.indiatvnews.com/news/india/jagannath-temple-to-be-lit-up-by-solar-power-8682.html>, accessed October 17, 2018.

¹⁵ <https://timesofindia.indiatimes.com/home/environment/developmental-issues/Jagannath-temple-to-turn-green-with-solar-power/articleshow/17038589.cms>, accessed October 17, 2018.

¹⁶ Kilowatt peak is the rate at which the solar panels generate energy at peak performance. As a rule of thumb, a 1 kWp plant will generate about 4 kWh per day

¹⁷ Grid Tie system is a grid energy storage system which links to the mains to feed excess capacity back from local mains electrical grid.

¹⁸ <http://www.thehindu.com/news/cities/Delhi/solar-power-for-lotus-temple/article7782217.ece>, accessed October 17, 2018.

¹⁹ http://www.tatapowersolar.com/news_files/press/Press%20release_Tata%20Power%20Solar%20%20-%20Lotus%20Temple%20collaborate%20for%20the%20temples%201st%20renewable%20energy%20project_2nd%20Nov%202015.pdf, accessed October 17, 2018.

²⁰ BSES Rajdhani Power Limited is a Joint Venture of Reliance Infrastructure Ltd. & Govt. of NCT of Delhi. BSES was formerly called Bombay Suburban Electric Supply.

²¹ BSES Rajdhani Power Limited, Annual Report 2016-2017, p.36.

temple trust estimates that the plant will prevent 17.72 tons of Co2 from being released into the air annually. The temple trust spent Rs.0.90 million (about US\$ 13,500) to install the plant.²²

Shri Mata Vaishno Devi Shrine Board, Jammu and Kashmir

Overview: The holy cave of Mata Vaishno Devi is situated at an altitude of 5,200 ft, a 12km trek away from the base camp in Katra, a small town in Jammu and Kashmir. Shri Mata Vaishno Devi Shrine Board manages the administration and governance of Shri Mata Vaishno Devi Shrine and has undertaken various activities for upgrading the sanitation, cleanliness and civic amenities in Katra.

Description: In a significant initiative to promote green technologies and to curb the use of plastic and polythene, the Shrine Board has resorted to the use of eco-friendly non-woven bags, jute bags, corn starch-based bags etc for packing purposes. It has installed waterless urinals in the Bhawan area, the holy cave and ultimate destination of the pilgrims, the technology of which helps save 70% water amounting to 35 million litres of water every year. For ensuring sanitation and cleanliness on the 12km track and in the entire Shrine area, cluster sewage treatment plants in various accommodation clusters and at major pilgrim stations have been set up. During the Financial Year (FY) 2016-17, the Shrine Board replaced 1400 conventional street lights with energy efficient LED lights. In addition, the board has been organising special sanitation campaigns, undertaking soil moisture conservation measures, working on designing of waste sewerage handling system and construction of check dams in the Katra area.²³ In 2014, Rajasthan Electronics & Instruments Limited set up the biggest solar rooftop plant in Jammu and Kashmir. A 1 MWp Solar Plant worth Rs. 85.2 million (US \$ 1.3 million) was constructed at Shri Mata Vaishno Devi Katra Railway Station which generates 5,000 units daily, saving of close to Rs. 10 million (about US\$ 150,000) and allowing for an annual reduction of 10,000 tons Co2. Out of the units produced daily, 1,700 to 1,800 units are utilized by Shri Mata Vaishno Devi Katra Railway Station, whereas 3,200 to 3,300 units are exported to Power Development Department of Jammu and Kashmir government.²⁴

Sri Sai Baba Temple, Shirdi, Maharashtra

Overview: The Sai Baba temple of Shirdi's green measures include harnessing solar power to cook meals for devotees, lighting up the premises and installation of energy pedals.

Description: In 2009, Sri Sai Baba Temple in Shirdi achieved the title of the world's largest solar parabolic concentrated technology system after the Tirumala temple. The system was installed at a cost of Rs.13.3 million (about US\$ 200,000), for which MNRE provided a subsidy of Rs.5.840 million (about US\$ 90 million).²⁵ The system comprises of 73 parabolic dishes with automated sun tracking system that helps the dishes rotate continuously along with the sun's movement to harness the solar rays. The system generates about 3,500 kg of steam daily allowing cooking food for 20,000 people per day and hence saving nearly 100,000 kg of cooking gas annually estimated to a cost of Rs.2 million (more than US\$ 30,000).²⁶

²² <http://grinity.in/2017/10/10/temple-first-mumbai-suburb-use-solar-energy-will-cut-annual-power-bill-rs-2-60-lakh/>, accessed accessed October 17, 2018.

²³ Shri Mata Vaishno Devi Shrine Trust, Administrative report, 2016-2017.

²⁴ <https://economictimes.indiatimes.com/industry/transportation/railways/katra-solar-project-to-save-rs-1-crore-energy-bill-for-railways/articleshow/49631529.cms>, accessed October 17, 2018.

²⁵ <https://www.hindustantimes.com/delhi-news/world-s-largest-solar-steam-system-inaugurated-at-shirdi/story-uo6EKAfwKNqu4UMfHdQTWI.html>, accessed October 17, 2018.

²⁶ http://zeenews.india.com/home/worlds-largest-solar-steam-system-at-shirdi-in-maharashtra_552316.html, accessed October 17, 2018.

With an average footfall of 50,000 per day at the shrine, Shri Saibaba Sansthan Trust (SSST) announced the installation of 'energy pedals' in 2017 to make use of the walking energy of devotees to convert to power. This innovative method of power generation takes kinetic energy generated by devotees walking to harness power for bulbs and fans in the temple area.²⁷

Swaminarayan Akshardham Mandir, Delhi

Overview: Swaminarayan Akshardham Mandir, inaugurated in 2005, is the world's largest Hindu temple. Their green measures include harnessing solar power to cook meals for devotees.

Description: In 2012, Swaminarayan Akshardham installed a solar concentrator, essentially a large Solar Parabolic Dish, which has the capacity to save about 30-50 Nm³ natural gas per day²⁸. The overall project cost the temple Rs. 2.1 million (US\$ 32,361).²⁹ The technology caters to the cooking energy needs of up to 4,000 people capturing solar energy and converting into steam.

The MNRE is implementing a program on Concentrating Solar Thermal (CST) technology and encouraging its use in various industries, under the 'Off-grid and Decentralized Solar Applications' program of India's National Solar Mission, which has seen significant policy focus by the Indian government to promote the use of solar power in the economy. Akshardham was awarded the Concentrating Solar Technology (CST) & Solar Cooker Excellence Award in 2016 by the MNRE,³⁰ in recognition of its notable achievements in off-grid and decentralized solar applications.

Tirumala Temple, Tirupati, Andhra Pradesh

Overview: Tirumala Temple in Tirupati is the second richest temple in the world after Sree Padmanabha Swami Temple in Thiruvananthapuram, Kerala. It has more than 100,000 visitors daily, has about Rs. 500 billion (about US\$ 7.5 billion) worth of treasures and receives Rs. 6.5 billion (About US\$ 97.5 million) in donations annually. Their green measures include community kitchen using solar power, replacement of halogen street lights with LED street lights, plastic recycling, afforestation and conservation of water.

Description: The temple promotes sustainable technologies and creates awareness amongst the masses. It has developed reserve forests around the temple to act as carbon sinks. Furthermore, within the temple complex, a large multi-storey building dedicated towards making 50,000 kg rice and lentils every day for devotees stands as an example of its biggest green project. Rows of solar dishes that automatically move with the angle of the sun capture the strong sunlight and generate over 4,000 kgs of steam a day at 180°C, making the cooking faster and cheaper. As a result, 48,180 litres of diesel are saved annually. Switching to such green technology projects has allowed the temple to cut carbon emissions and earn carbon offset or credits that can be traded.³¹

²⁷ <https://economictimes.indiatimes.com/news/politics-and-nation/shirdi-trust-to-use-foot-energy-of-devotees-to-generate-power/articleshow/58958802.cms>, accessed October 17, 2018.

²⁸ Nm³ is a common unit used in industry to refer to gas emissions or. exchange. It stands for Normal cubic meter.

²⁹ <http://mnre.gov.in/file-manager/solar-thermal-newsletter/volume-ii-issue-5/EN/SolarThermalHeat/solarHeat04.php>, accessed October 17, 2018.

³⁰ <http://www.baps.org/News/2016/Akshardham-receives-Solar-Technology-Excellence-Award-9784.aspx>, accessed October 17, 2018.

³¹ <https://www.iskconnews.org/tech-conversion-indias-richest-shrine-goes-green.3121>, accessed October 17, 2018.

The Tirumala Tirupati Devasthanam (TTD)³² management has taken a lead in generating green power to meet its ever-increasing demand for power consumption. In 2002, Tirumala adopted the solar cooking technology, allowing it to drastically cut down on diesel usage. The solar dishes on the temple roof rotate automatically to capture the sun's energy, used to convert water into high pressure steam, making cooking faster and cheaper. This was the world's largest solar steam cooking system (until July 2009, when the Saibaba Ashram in Shirdi inaugurated their solar thermal cooking system), with 106 solar panels, adequate for cooking two meals for 15,000 people.³³ This system has helped the temple save close to Rs.2 million (more than US\$ 30,000) a year and roughly 48,000 gallons of diesel every year, thus reducing Co2 emissions by 438 tons annually.³⁴ ³⁵ The total project cost for this was Rs.11 million (about US\$ 165,000), of which half was borne by TTD Board, and the other half was a subsidy from the MNRE. ³⁶ In 2016, Ganges Internationale (GIPL) won the mandate to set up 10 MW solar mounting structures and tracking systems for Tirumala, as well to help access approximately 16,060 MWh of electricity annually.³⁷

The temple has installed wind turbines to generate 2,738 MW of power annually offsetting 19,500 tons of Co2. ³⁸ In 2017, TTD introduced LED lighting system worth Rs.45 million (about US\$ 675,000) to replace halogen lighting as an eco-friendly energy conservation initiative to reduce radiation and warmth. This initiative has also helped reduce their annual power bills by 40% from Rs.270 million (about US\$ 4.1 million).³⁹

The temple city has been identified as a future 'low-carbon footprint city' by European Aid and Development, part of the European Commission. The temple sells the emission reduction credits to a Swiss green technology enterprise, Good Energies Inc.⁴⁰

TTD has banned plastic bottles inside the temple, as a step toward making Tirupati Hills a plastic-free zone. It has set up a recycling plant near the temple complex to crush 150 kg of plastic bottles daily, making them into pipes, which are then sold to farmers at subsidized prices for micro irrigation.⁴¹

The Haritha Project was launched in 2000 at a cost of Rs.15 million (about US\$ 225,000) to conserve ground water resources and the forests on the Tirumala Hills. TTD's dedicated forestry department has planted more than 4.4 million

³² TTD is the conglomeration of 12 temple shrines and sub-shrines in Tirupati whose management or group of trustees controls the Tirumala temple affairs. This independent manages the temple and oversees the operations and finances.

³³ Case Study: Successful commercialization of Solar Concentrators in India and its suture in process Industry and power generation, Gadhia Solar Energy Systems Pvt. Ltd. Gadhia Solar Energy Systems Pvt. Ltd. (GSESL) of Gujarat has installed the steam cooking system on the terrace of Nitya Annadanam canteen at Tirumala.

³⁴ <http://www.thehindu.com/features/homes-and-gardens/looking-up-to-the-sun/article3609706.ece>, accessed October 17, 2018.

³⁵ <https://timesofindia.indiatimes.com/city/chennai/Solar-energy-to-cook-30k-meals-at-university/articleshow/4726290.cms>, accessed October 17, 2018.

³⁶ <http://www.thehindu.com/features/homes-and-gardens/looking-up-to-the-sun/article3609706.ece>, accessed October 17, 2018.

³⁷ <http://www.projectsmonitor.com/daily-wire/ganges-internationale-install-10-mw-ground-mount-structure-tirupati-tirumala-devasthanams/>, accessed October 17, 2018.

³⁸ Balachander, J. (2015), Green Temples Guide, p.19.

³⁹ <https://www.deccanchronicle.com/nation/in-other-news/030817/ttd-to-fix-leds-to-cut-power-bill.html>, accessed October 17, 2018.

⁴⁰ Balachander, J. (2015), Green Temples Guide, p.18.

⁴¹ Balachander, J. (2015), Green Temples Guide, p.19.

trees to restore vegetation on the Tirumala hills.⁴² As an effort towards conservation of water, they have built 89 check dams, 136 Gabrion check dams, 3,884 rock fill dams.⁴³

Islamic Institutions

Ambar Mosque, Uttar Pradesh

Overview: Ambar Mosque, Lucknow's first all-women mosque, made an effort towards harnessing renewable energy for sustainable development by solarising itself from February 2017 and setting an example for other cities and religious institutions.

Description: Established in 1997 by Shaista Ambar, founder president of All-India Muslim Women Personal Law Board, the Ambar Mosque in Lucknow started using solar energy to reduce its dependence on electricity produced from highly polluting sources such as coal. The mosque's 1 kW solar power installation is an on-grid system that doesn't require batteries and produces about 1,400 units annually which accounts for 75% of its energy consumption. Any excess energy that is produced is fed back to the grid and the mosque is provided with solar credits that helps the mosque offset their electricity bill. The system built with an estimated cost of Rs.120,000 (about US\$ 1,800) was donated to the mosque by the manufacturing company. It has helped the mosque make more than 70% savings on annual electricity expenditure and offset 1 metric ton of carbon dioxide (Co2) every year. ⁴⁴ The inauguration of the solar project at the mosque was attended by priests from various religions like Christian, Sikh and Hindu other than Muslim. The mosque aims to set an example for and continue to inspire other cities and religions across the world to shift to the usage of renewable energy sources.

Badriya Juma Masjid, Karnataka

Overview: Badriya Juma Masjid located in Udipi district of Karnataka was rebuilt by Syed Mohamed Beary, Chairman of a prominent Bengaluru-based real estate developer, on his ancestral land as a step towards embracing sustainability through modern architecture. The mosque uses hybrid renewable energy, both from sun and wind, to meet its entire energy requirements. The building design is intended as an evolution in core Islamic designs; it includes calligraphy illustrations and Islamic architecture that integrates sustainable technologies.

Description: Badriya Juma Masjid is the world's first zero energy eco-friendly green building that exemplifies contemporary eco-friendly design incorporated in traditional architecture. It features modern elements of architecture like a sun-reflecting terrace floor, laid with white China tiles and fitted turbo vents offering natural cooling. The mosque also maintains old traditional features like the 'Parda' walls or perforated screens made up of non-conducting glass reinforced concrete with up to 50% openings in an ornamental pattern that allows for adequate daylight and cross ventilation mechanism, making the mosque a breathing building.

The 15,000 sq. ft. building was built at an estimated cost of Rs. 20 million (about US\$ 300,000). A great amount of effort was taken towards maintaining the contour and keeping the environment unchanged during the construction of the mosque that took nearly three years to complete since 2013. As the mosque wasn't originally facing the Kaaba in Mecca (center of Islam's most important religious site and hence the direction in which Muslims should be facing while offering prayers), the mosque was lifted 12 feet above the ground and twisted as per the required alignment. This process,

⁴² Balachander, J. (2015), Green Temples Guide, p.18.

⁴³ <http://www.tirumala.org/SAHarithaProject.aspx>, accessed October 17, 2018.

⁴⁴ <https://globalnytt.dk/content/indiens-foerste-moske-kvinder-drives-ny-paa-ren-solenergi>, accessed October 17, 2018.

however, did not disturb the surrounding environment and ensured every tree was protected and blended within the mosque's design.

Offering a natural cooling environment is the wind scoop that allows for wind energy generation through wind mills on the 70-foot multifunctional minaret which not only serves to give the call for prayer but forces down a draft of cool breeze into the prayer hall. Maintaining the colour code of white, primarily eradicates the dependency on electric lights or AC's, allowing for a very low carbon footprint. The 'L' shaped building plan with elevated nature of the prayer hall, the green vegetation and water tanks around the mosque further offer a naturally cooled environment and help in water conservation as well. In terms of energy savings, the use of hybrid renewable energy from solar and wind in the mosque allows the mosque to consume only six kW power as opposed to the actual requirement of 40-50 kW. The mosque is said to produce more energy than used, thus feeding energy back to state grid and accruing solar credits for another 25 years.⁴⁵

In 2016, Badriya Juma Masjid was awarded the Platinum award under the specialized category 'IGBC green place of worship' by the Indian Green Building Council (IGBC) of Confederation of Indian Industry (CII), one of India's leading chambers of commerce,⁴⁶ as appreciation for its green and energy efficiency technologies featured in the mosque's design.

Jama Masjid, Maharashtra

Overview: In 2017, 243-year-old Jama Masjid in Kalbadevi, Mumbai became the third mosque in Mumbai after Minara Masjid and Zakaria Masjid, to switch to solar energy to meet 70% of its electricity requirements. Built in 1775, the mosque is home to a digitised library with rare manuscripts from 1890s.⁴⁷

Description: Jama Masjid, a cultural center piece in Mumbai, was sanctioned with a 31 kWp rooftop solar setup consisting of 92 panels in 2017 to power electricity to the lights, fans, lifts and air conditioners in the mosque and its common areas. The high power solar set up installed at the mosque generates about 45,700 kWh annually and fulfils 70% of the mosque's electricity requirements. It has helped the mosque reduce its electricity bills by 67% from Rs.60,000 (about USD 900) to Rs.20,000 (about USD 300) and has also reduced carbon emissions by 35 tons annually. The mosque has also installed a net-metering system which allows surplus power to be fed back into the grid and any deficiency to be imported from the grid. This system not only benefits the mosque but also helps supply power to areas in the city where electricity is under supplied.⁴⁸

Madarsa-e-Mohammadiya, Maharashtra

Overview: Madrasa-e-Mohammadiya, also known as Akash Masjid in Mumbai, became the fourth masjid in the city after Minara Masjid, Zakaria Masjid and Jama Masjid to adopt solar energy. Earlier this year, the two-storey mosque installed a 9 kWp solar system with 27 panels on its rooftop.

⁴⁵ <https://www.deccanherald.com/content/523278/badriya-juma-masjid-zero-energy.html>, accessed October 17, 2018.

⁴⁶ Indian Green Building Council (IGBC) is a part of the Confederation of Indian Industry (CII). The council develops new green building rating programmes and provides certification services.

⁴⁷ <https://www.hindustantimes.com/mumbai-news/south-mumbai-mosque-opts-for-solar-energy-slashes-electricity-bills-by-67/story-dAZst1vS8ZTbkWVMOM2EuM.html>, accessed October 17, 2018.

⁴⁸ <https://www.hindustantimes.com/mumbai-news/south-mumbai-mosque-opts-for-solar-energy-slashes-electricity-bills-by-67/story-dAZst1vS8ZTbkWVMOM2EuM.html>, accessed October 17, 2018.

Description: In January 2018, Madrasa-e-Mohammadiya installed a rooftop solar system generating about 35 kWh per day to power 13 air conditioning units, 30 lights and 20 fans across the entire mosque. The mosque trust spent about Rs. 0.67 million (US\$ 10,000) to install the solar system which helped reduce close to 75% of their monthly electricity bills. The system mitigates around 18 tons of Co2 annually which is equivalent to planting close to 45 full grown teak trees. The mosque plans to make its entire complex zero energy with 100% of its energy requirement being supplied from renewable sources.⁴⁹

Minara Masjid Mosque, Maharashtra

Overview: Minara Masjid, one of the oldest and most prominent mosques in Mumbai became the first mosque in Mumbai to go solar in 2017. The solarisation led to an immediate cost saving of 50% on monthly electricity bills and helped electricity consumption fall by 40%.^{50 51} The system has allowed reduction in Co2 emissions by 16 tons annually.⁵²

Description: In 2017, Minara Masjid installed a 15kW solar panel generating about 45 kWh to 70 kWh solar power per day, on its roof to power the lights, fans and air conditioners at all the common areas within the mosque. A total of 46 solar panels, with an annual capacity of about 21,200 kWh were installed at the cost of Rs.1.18 million (about US\$ 18,000), resulting to a net annual saving of Rs.0.32 million (about US\$ 4,800).⁵³

Jain Institutions

Ahinsa Sthal, Delhi

Overview: Ahinsa Sthal, a prominent Jain temple in Delhi, committed itself to environmental sustainability in 2017 by adopting solar power.

Description: In 2017, CleanMax Solar, India's largest provider of solar power to leading corporates, donated a 6.4 kWp rooftop solar plant to Ahinsa Sthal. This was a significant step towards reducing carbon footprint that also helped the temple save Rs.50,000 (about US\$ 750) on annual electricity expenditure. The solar plant installed at the temple generates 8.7 MWh annually and helps replace more than 35% of the temple's electricity consumption. The system is equipped with a net metering facility that allows the temple to feed 25% of the solar energy back into the grid in exchange of solar credits and helps the temple avail a billing mechanism for the net energy consumed, leading to reduced future electricity bills.⁵⁴

Manas Mandir, Maharashtra

Overview: The Manas Mandir Jain temple located in the outskirts of Mumbai has one of the largest solar rooftop projects around Mumbai.

⁴⁹ <https://www.hindustantimes.com/mumbai-news/south-mumbai-mosque-looks-up-trims-power-bill/story-UJoPIre4CYkAZBEfgNFT4N.html>, accessed October 17, 2018.

⁵⁰ <http://www.maharashtratoday.in/mumbai-minara-masjid-use-solar-energy-saves-power-bill-half/>, accessed October 17, 2018.

⁵¹ <https://www.mid-day.com/articles/minara-masjid-goes-green-solar-power-plant-electricity-mumbai-news/17888174>, accessed October 17, 2018.

⁵² https://www.recgroup.com/sites/default/files/documents/rec_refcase_comm_india_minara_masjid_15kw_2017_en_web_20171130.pdf, accessed October 17, 2018.

⁵³ <https://www.hindustantimes.com/mumbai-news/minara-masjid-first-shrine-in-mumbai-to-use-solar-energy-cuts-power-bill-by-half/story-UrsL9dfHankJMD06sw12pN.html>, accessed October 17, 2018.

⁵⁴ https://www.indiatoday.in/pr-newswire?rkey=20180521enIN201805211354_indiapublic&filter=4315, accessed October 17, 2018.

Description: In 2017, Manas Mandir completed a 100kW solar power project with the installation of solar panels on two rooftops within the temple premise, of which 70kW was on their dining hall area and the remainder atop their guest house.⁵⁵ The temple invested around Rs.4 million (about US\$ 60,000) to install the system which has the capacity of generating around 145,000 units on an annual basis. The system has accounted for over 40% of the energy requirements of the temple and helped save close to Rs.1.5 million (about US\$ 22,500) in electricity costs annually.⁵⁶ The temple has an annual requirement of 250 kW which it intends to meet in the next phase of the project soon and hopes to receive a net metering license which will help excess power to be fed back to the grid and bring additional savings.⁵⁷

Sheth Motisha Jain Temple, Maharashtra

Overview: The 190-year-old Sheth Motisha Jain temple in Mumbai installed solar panels in their temple premises in 2017 to substitute electricity with renewable solar power. Though there is no electricity used inside the temple, the solar installation helps light the temple premises and surrounding areas.

Description: Sheth Motisha Jain Temple, spread across two acres, installed a 37.5 kW power rooftop solar system with 115 panels in 2017 to help power the lights and fans of their pathways around the temple, guest accommodations for devotees, store rooms and dining area. The 37.5 kW rooftop solar system with 115 panels generates about 160 kWh electricity per day on an average. The system was installed with a total cost of Rs.2.6 million (US\$ 39,000) along with a net-metering system, which allows surplus power generated by solar to be exported back to the grid and any deficiency to be imported from the grid. The solar system has helped the temple save Rs.0.8 million (about US\$ 12,000) on electricity bills annually. This has been the first phase of the temple's solar project that aims at converting the entire campus into solar power zone.⁵⁸

Sikh Institutions

EcoAmritsar, an EcoSikh initiative in Punjab

Overview: EcoAmritsar is an initiative launched in 2012, which works towards making Amritsar a greener city, preserving its natural resources and caring for the city's environment. Their green measures include afforestation projects, a Green Gurdwara project to encourage gurdwaras to use renewable energy, water conservation techniques, waste reduction and recycling, and organic and healthy food systems. They have also developed the Green Nagar Kirtan and Go Green-Go Clean campaigns and organize awareness workshops on nontoxic natural farming and waste disposal.

Description: EcoSikh was initiated by Alliance of Religions and Conservation (ARC) with the UNDP. It connects Sikh values, beliefs, and institutions to the most important environmental issues facing the world. EcoSikh has focused upon curbing pollution on *Gurpurabs* (Sikh religious celebrations), encouraging water preservation in homes and gurdwaras, mandating environmental leadership training in the Sikh Missionary Colleges, reducing plastics and styrofoam in Sikh institutions, and switching to organic food.

EcoAmritsar is an initiative launched by EcoSikh in 2012, that is supported by a diversity of local stakeholders to make Amritsar a greener city. They work towards making the City of Amritsar reduce waste, conserve water, and expand

⁵⁵ <https://timesofindia.indiatimes.com/city/mumbai/jain-temple-installs-solar-panel-to-save-environment/articleshow/62286888.cms>, accessed October 17, 2018.

⁵⁶ <http://www.solarquarter.com/index.php/world/73-asia-australia/india/7442-manas-mandir-jain-derasar-goes-solar>, accessed October 17, 2018.

⁵⁷ <https://timesofindia.indiatimes.com/city/mumbai/jain-temple-installs-solar-panel-to-save-environment/articleshow/62286888.cms>, accessed October 17, 2018.

⁵⁸ <https://www.hindustantimes.com/mumbai-news/mumbai-temple-to-reduce-annual-power-bills-by-rs8-lakh-using-solar-energy/story-JEEJGRIfUgXTxXiV3DU6L.html>, accessed October 17, 2018.

greenery projects through tree plantings. They have launched the Go Green-Go Clean campaign that has set an example that non-forest cities can show huge improvements in their green cover under collaborative efforts by locals.

The initiative works with schools, communities and gurdwaras throughout Amritsar to celebrate Sikh Environment Day on March 14 every year when grassroots work such as planting trees, setting up organic food stalls and langars, organizing bicycle marathons to promote ecofriendly transportation systems, etc are done by individuals, communities and institutions for protection of the environment.

The initiative works with schools, communities and gurdwaras throughout Amritsar. Their Green Nagar Kirtan campaign, for example, involved hundreds of students from local colleges and Sikh pilgrims from nearby villages picking up litter after the Nagar Kirtans (a Sikh custom involving the processional singing of holy hymns throughout a community). They clean the roads after the Nagar Kirtans and share awareness material to shun plastics and styrofoam products from religious food stalls and promote ecological awareness amongst the natives.

EcoAmritsar also encourages corporates and citizens to save, harvest and recycle water. Institutions are urged to adopt energy saving devices and renewable energy alternatives through workshops and campaigns. They have been conducted workshops for nontoxic natural farming, and models are being created for zero garbage households and zero disposal parks.

They also have a 'Green Gurdwaras' project which is a grassroots movement led by gurdwaras that choose to reduce their impact on their environment through new ideas on renewable energy, water conservation, waste reduction and recycling, and organic and healthy food systems. Due to EcoSikh's intervention and continuous dialogue with the apex Shiromani Gurddwara Parbandhak Committee (SGPC), they agreed to start organic langar at the Golden Temple. Today 7-acre of their Gurdwara owned farms, produce organic food which is served at their 24-hour free kitchen.^{59 60} The Golden Temple in Amritsar harnesses solar energy and works on waste management, and the gurdwara at Kali Bein in rural Punjab uses biofuel made of kitchen scraps. EcoAmritsar has helped fund a green bus to bring villagers into Amritsar every night to help clean the pilgrim streets leading to the Golden Temple.⁶¹

Golden Temple, Amritsar, Punjab

Overview: The Golden Temple in Amritsar in the state of Punjab, was formally known as Sri Harmandir Sahib and founded in 1577. It is the most revered spiritual site of Sikhism and welcomes close to 100,000 visitors visiting the shrine daily. The temple's green measures include harnessing of solar energy for the lighting, installation of solar water heaters, waste management and efforts for increasing green cover.

Description: In 2017, Mumbai-based Enpar Group volunteered to donate a solar energy system worth Rs.15 million (US\$ 225,000) to the Golden Temple through the Punjab Energy Development Agency (PEDA).⁶² The solar energy that is harnessed is used for cooking and feeding *langar* (community kitchen in a Gurdwara where a free meal is served to all the visitors, without distinction of religion, caste, gender, economic status or ethnicity). The installation of this solar

⁵⁹ <https://www.tribuneindia.com/news/punjab/community/sgpc-to-take-up-organic-farming-for-chemical-free-langar/120982.html>, accessed October 17, 2018..

⁶⁰ <https://www.hindustantimes.com/punjab/organic-langar-at-golden-temple-amritsar-other-gurdwaras-motivated-sgpc-started-organic-farming/story-cUvLcpqCymhk1tXwOK75wN.html>, accessed October 17, 2018.

⁶¹ <http://www.ecosikh.org/programmes/ecoamritsar/>, accessed October 17, 2018.

⁶² <https://www.hindustantimes.com/punjab/food-at-golden-temple-to-be-prepared-with-solar-energy/story-zWpe2gzlYyFimODGBC9MgP.html>, accessed October 17, 2018.

powered cooking system has reduced the average daily energy consumption in the community kitchen by half, to 50 LPG cylinders and around 25 quintals of firewood.⁶³

While we found other energy access projects were limited, in 2008, the Golden Temple did launch an initiative to increase green cover and raise awareness about protecting a girl child. This was in collaboration with The Nanhi Chaan Foundation, based out of neighbouring Haryana, that works on improving the lives of women and children, and focuses on community development, health and sanitation and education activities.

The 'buta parshad' initiative at the temple distributes saplings of various varieties of trees to the visitors at the shrine in the name of the newborn daughter or newlywed daughter-in-law of the family. The saplings are distributed at the entrance of the shrine. Normally 300-350 plants are distributed daily, but on special occasions, this can be as high as 500-550. The Nanhi Chaan Foundation notes down the details of the visitors and performs random checks to track the growth of the plants and wellbeing of the children.⁶⁴

Spiritual Institutions

Akshaya Patra Foundation, Karnataka

Overview: Akshaya Patra Foundation is the world's largest NGO, running a mid-day meal program across India. It reaches out to 1.6 million children from 13,808 schools across twelve states each day.⁶⁵

The Foundation has made their kitchens more eco-friendly and energy efficient over time. The kitchens use biomass pellets as fuel, have solar plants to convert sunlight directly to electricity, have a new technology in place to convert waste into electricity and have installed high-efficiency reverse osmosis systems.

Description: The Foundation adopted a new system that converts organic waste to biogas systems in their Ballari and Vasanthapura kitchens located in the southern state of Karnataka. These one-ton capacity organic waste anaerobic gas lift reactors are capable of generating 120-150 cubic meters of biogas, reducing cost and dependency on LPG. The biogas plants also help in eco-friendly handling of food wastages of approximately 20 metric ton every month. The foundation is looking at adopting similar technologies across all their kitchens in order to be able to sustain large operations, replacing LPG and serving nearly five million meals in the future. ⁶⁶ Their kitchen in Hyderabad has an effluent treatment plant that uses a Belgian technology to convert waste into biogas that is passed to a gas-based engine and connects to an alternator to produce electricity.

Akshaya Patra Foundation kitchens use biomass briquette as substitutes for coal, charcoal and diesel that produce about one-ton steam in one hour which is used for cooking. They also use high efficiency reverse osmosis systems generating 95% yield in their kitchens allowing only about 5% water wastage and ensuring higher recoveries and operational benefits, as opposed to conventional reverse osmosis systems that are at 75% efficiency or yield and lead to 25% water wastage.

⁶³ <https://www.hindustantimes.com/punjab/ht-explainer-how-and-why-golden-temple-s-langar-will-go-solar/story-KKEmQeyhwytvSeFL7nnE5M.html>, accessed October 17, 2018.

⁶⁴ <http://www.tribuneindia.com/news/punjab/-buta-parshad-takes-root-at-golden-temple/496727.html>, accessed October 17, 2018.

⁶⁵ <http://www.cleanfuture.co.in/2017/08/21/akshaya-patra-transforming-organic-waste-into-clean-energy/>, accessed October 17, 2018.

⁶⁶ <https://www.akshayapatra.org/news/first-of-its-kind-biogas-units>, accessed October 17, 2018.

Their Vasanthapura kitchen has a solar plant installed that runs with the use of photovoltaic (PV) cells that convert sunlight to direct electricity. The solar plant generates 1100 kWh power thereby saving up to Rs.96,000 (about US\$1440) annually on electricity.⁶⁷ These types of solar plants are installed in about ten Akshaya Patra mega kitchens and are supported by a net meter, that allows surplus power generated to be fed back into the grid and is especially beneficial on closure days/times.

In exchange, the state electricity board waives off a portion of the electricity bill, basis a pre-determined price, equivalent to the 'power credits' gained by the kitchens through energy exports to the grid. The net metering system integrated with the solar PV plant in the kitchens allows them to operate during non-conventional times of the day like early mornings and late nights as well when they are dependent upon state electricity supply, without worrying about high bills.

Auroville Foundation, Tamil Nadu

Overview: Auroville Foundation is a non-profit organisation that has expertise in ecological and socially responsible development. The organisation is based out of Auroville in Tamil Nadu, a UN-backed global centre of sustainable practices dedicated to the ideal of human unity. Auroville Consulting, a unit of the Auroville Foundation has been collaborating with academic, private and public-sector partners both in India and Internationally to develop sustainable urban development policies and ecologically friendly technologies. It has trained 160 municipal energy managers in Tamil Nadu in conducting building energy audits and implementing energy efficiency programs. Their plan is to solarise at least 100 villages in Tamil Nadu through their solar village initiative.^{68 69}

Description: Auroville Consulting believes that one of the key challenges in rural India is irregular power supply and with Villupuram district in Tamil Nadu facing 4-6 hours power cuts on a daily basis, their solar village initiative will be able to provide 24x7 equal access to clean, reliable and renewable electricity to at least 100 villages in the state and further help with economic development. The initiative also aims at having less environmental and health concerns related to energy use, employment generation and capacity building of villages for the operation and management of the solar plants and co ownership of local energy plants at village level. In 2015, the government passed the first order for their 170-kW solar village project costing around US\$ 459,000. The solar PV installation for this is currently being tendered. They are also running a pilot project in Irumbai Village in Tamil Nadu and are pushing the current regulations and policies to get the Energy Regulators to permit solar energy generators of less than 1 MW to export/sell to the grid and to use existing low-tension electrical infrastructure, both of which are currently not allowed. In parallel, they have designed an incentivized search engine that builds solar PV power plants with its ad revenues as an effort towards raising funds for green measures in the villages of the Villupuram district.

Auroville Consulting's future solar village plan is to install solar PV systems that can produce electricity for sufficient current consumption and also make the village energy positive. The solar energy generators will be connected to the existing low-tension distribution system at the village through which the surplus energy will be exported and consumed at the nearest load. The surplus will be sold to state utility or third parties and the village will benefit from a demographic ownership model of revenue distribution where the village will get a share of up to ten percent of net revenue. This will be

⁶⁷ <https://blog.akshayapatra.org/world-environment-day/>, accessed October 17, 2018.

⁶⁸ <http://www.aurovilleconsulting.com>, accessed October 17, 2018.

⁶⁹ <https://www.thesolarvillage.org/about>, accessed October 17, 2018.

used for village developmental programs (such as sanitation, water supply etc.) through participatory budgeting with active help from the local women's welfare.⁷⁰

Brahma Kumaris, Rajasthan

Overview: Since the mid-90s, Brahma Kumaris movement has become a leading developer and promoter of renewable energy in India. It has created a solar plant in Rajasthan, has a separate wing on rural development that works on literacy, health, youth leadership programs and also has a sustainable yogic agriculture project that promotes organic farming.

Description: The Rural Development Wing of the movement works on improving the condition of rural children and youth through leadership programs, child development camps and character development programs. It also works on eliminating illiteracy and unhealthy social practices, fostering healthy lifestyles through educational programs, exhibitions and lectures in health and hygiene and organise medical camps. The Wing organizes events to educate and spiritually empower farmers, herdsmen, administrative officials at the village and district levels, and others involved in rural development work.⁷¹

Their *Yogic Kheti* (yogic agriculture) project in Gujarat trains farmers to work with techniques of organic farming that reduce the pressure on the environment and are cost-effective for farmers. Agricultural fairs, rallies, seminars, conferences, workshops, exhibitions and camps are included in this project part of their vision of *Gokul Gaon* (an ideal village).⁷²

With the support from Indian and German governments, Brahma Kumaris has carried out various research and development projects in renewable energy. Its sister organization, the World Renewal Spiritual Trust (WRST), a registered charity in India and Brahma Kumari itself were recognized as a Scientific and Industrial Research Organization by the Indian Ministry of Science and Technology. Brahma Kumaris is conducting research on solar steam cooking systems, thermal power generation and thermal storage, PV stand-alone systems and solar hot water plants. In 2014 an "Awareness & Training Centre" was set up by Brahma Kumaris & WRST with financial support from the UNDP, Global Environment Facility and the MNRE.

Brahma Kumaris has developed and installed six large solar systems which produce steam for various process applications such as cooking, laundry and sterilization. In 1999, a 780 sqm capacity Concentrated Solar Project was implemented by them for the purpose of community cooking. The plant was installed on the roof top of its Shantivan campus in state of Rajasthan. The project was set up at a cost of Rs. 7 million (about US\$ 105,000) with a Rs. 1 million (more than US\$ 15,000)⁷³ from MNRE and additional assistance from the German government.

The organisation has also installed and operates around 350 PV battery systems (off-grid) all over India with a total capacity of more than 1200 kW peak.⁷⁴

⁷⁰ Auroville Consulting, Solar Village concept document.

⁷¹ <http://www.brahmakumaris.com/service-wings/rural-development-wing/>, accessed October 17, 2018.

⁷² <http://yogickheti.org/project-details.html>, accessed October 17, 2018.

⁷³ <http://www.cshindia.in/images/Cooking/Shantivan.pdf>, accessed October 17, 2018.

⁷⁴ <http://www.brahmakumaris.org/hope/renewable-energy/from-a-spiritual-vision-to-local-action>, accessed October 17, 2018.

'India One', a 1 Mega Watt (MW) solar thermal power plant situated near the Shantivan campus was completed in 2017. This innovative project, spread across 25 acres, uses 770 newly developed 60 sqm parabolic dishes and features thermal storage for 16 hours continuous operations for base load. The plant generates enough heat and power for a campus of 25,000 people and 35,000 meals a day and is a milestone for decentralized and clean power generation in India. The overall budget for the project was around Rs.80.25 million (about US\$1.20 million) and the funding request was approved by MNRE and the German Ministry for Environment, Nature Conservation and Nuclear Safety.⁷⁵

Chinmaya Mission, worldwide

Overview: Chinmaya Organization for Rural Development (CORD) in Himachal Pradesh has been working towards comprehensive community development at the grassroots. It was established in 1986. The Chinmaya Mission has redesigned their Paramdham campus in the state of Gujarat as a 'green building'.

Description: CORD is the service wing of Chinmaya Mission and operates as an NGO. It has been active in holistic rural development for over two decades. It facilitates integrated, participatory and sustainable rural development in the villages of several states, including Odisha, Tamil Nadu, Andhra Pradesh and Himachal Pradesh, through guidance, funding and monitoring. The CORD that functions in Himachal Pradesh, creates its Community Based Organizations (CBOs) like *Mahila Mandals* (women's groups), self-help groups, children's group, farmer's club, following the *panchayat* (village leadership) structure. These work on health, nutrition, literacy, hygiene, sanitation, gender sensitization, social justice, natural resource management. Their farmer training center encourages farmers to use sustainable farming and modern training methods for farming and also works with water resource conservation, water shed development and biological nitrogen fixation. CORD has facilitated over 400 organic manure production units across Himachal Pradesh.⁷⁶

Chinmaya Mission reconstructed their Paramdham campus into a green building ensuring resource efficiency throughout its building lifecycle from planning to construction using sustainable design specifications and appropriate choice of materials. This consequently helped reduce consumption of energy and carbon footprint of buildings. In 2017 ParamDham, Chinmaya Mission Ahmedabad and its architects, JMA Design Company, were awarded the first prize for 'Green Buildings' by Housing & Urban Development Corporation (HUDCO), a well-known organization in the field of sustainable urban development.⁷⁷

Embracing the World, Sri Mata Amritanandamayi Devi, Amritapuri, Kerala

Overview: Embracing the World is a global network of charitable projects conceived by Sri Mata Amritanandamayi Devi, a Hindu spiritual leader and guru in the south of India better known as Amma, or 'Mother'. Their green measures include plastic recycling, afforestation, rain water harvesting and organic cultivation. Their Amrita Vishwapeetham (Amrita University) in the state of Tamil Nadu has research and curriculum dedicated to sustainability and research in eco-friendly technologies for greening.

Description: Embracing the World is a member organization of the United Nations Billion Tree Campaign and has organized the planting of more than a million trees globally since 2001.

GreenFriends was established by the Ashram for the preservation and protection of the environment and has been working worldwide in the areas of greenhouse gardening, vegetable and flower gardening in rural lands, afforestation, soil

⁷⁵ <http://www.india-one.net/>, accessed October 17, 2018. Project cost was €10 million, converted to INR.

⁷⁶ CORD Annual Narrative Report, 2016-2017, p.26.

⁷⁷ <http://www.chinmayamission.com/hudco-award-chinmaya-paramdham-green-category/>, accessed October 17, 2018.

and land restoration, rainwater catchment, waste recycling, and environmental awareness training and workshop sessions.⁷⁸

In Europe, GreenFriends is using organic cultivation methods and developing seed banks to preserve local, ancient and/or endangered seeds. In the USA, Embracing the World has launched a tree sponsorship program with the goal of reforesting 80 acres of land with 40,000 pine trees. In India, volunteers are using non-recyclable hard plastic packing straps to weave bed bases for metal-framed foldaway beds for disaster survivors.⁷⁹

The Plastic Project, active in India, North America, Japan and Europe, teaches participants simple techniques to recycle plastic packaging into durable, fashionable products like bags, purses, mobile phone cases, and even material for cots to be used in emergency relief. Compost treatment systems have been put in place at many of their centers worldwide. In India, their institutions produce more than eight tons of compost each day. They have a recycling center at their international headquarters in Amritapuri in the state of Kerala, which serves as an educational model of professional waste management. Embracing the World centers across the world host workshops on sustainable living and employ rainwater harvesting, produce food from organic farming and make organic fruit and vegetables available to their local communities.⁸⁰ The use of organic farming at centers globally is common across some other Hindu organisations covered in this report, such as ISCKON.

Amrita University's curriculum is devoted to sustainability in the areas of organic farming, cleaning programs, deployment of eco-friendly technologies for greening and cleaning and empowering students to advance such technologies by pursuing active research in these areas. By doing this, the next generation have the opportunity to learn about bottom-of-the-pyramid and rural methods of promoting and preserving energy access.

Isha Foundation, Tamil Nadu

Overview: Isha Foundation is a spiritual organization founded in 1992 by Sadhguru Jaggi Vasudev. Apart from yoga programs, they are associated with a number of social and environmental initiatives like Project GreenHands, which works towards increasing green cover and restoring soil health.

Description: The Vanashree Eco Center was an ecological initiative of Isha Foundation to preserve the delicate ecology and the rich bio-diversity of the Velliangiri Mountains in Tamil Nadu. The initiative has now been merged with the foundation's Project GreenHands initiative which aims to take corrective measures to increase green cover, restore soil health and manage natural resources appropriately. The project is involved in several rural and urban greening campaigns and has partnered with the government, corporates, educational institutions and NGOs in various environmental initiatives. They help promote hands-on environmental education and also the planting of ecologically and economically beneficial tree saplings in farmlands. A mass tree planting marathon was held in 2006 that resulted in 852,587 saplings being planted in 6284 locations across 27 districts in the state, by over 256,289 volunteers in just one day, setting a Guinness World Record. The 2007 and 2008 tree planting campaigns of the project have led to the plantation of 7.1 million of trees.⁸¹ They have close to two million volunteers.⁸²

⁷⁸ <http://amma.org/groups/north-america/projects/green-friends>, accessed October 17, 2018.

⁷⁹ <http://amma.org/global-charities/green-initiatives>, accessed October 17, 2018.

⁸⁰ <http://www.embracingtheworld.org/environment/>, accessed October 17, 2018.

⁸¹ <http://www.ishafoundation.org/ProjectGreenHands>, accessed October 17, 2018.

⁸² <http://isha.sadhguru.org/social-outreach/project-greenhands/>, accessed October 17, 2018.

Radha Soami Satsang Beas, Punjab

Overview: Radha Soami was founded in 1891. The organisation operates multiple charitable initiatives in the field of environment and education.

Description: Radha Soami Satsang Beas, in technical collaboration with Punjab Energy Development Agency, built the world's largest single rooftop solar facility with the capacity to produce 11.5 MW electricity at a cost of Rs.1.39 billion (about US\$ 21 million) in 2016. Tata Power Solar took up the management and execution responsibilities of the project equipped with net metering facility, which helps generate 15 million units annually and offsets 19,000 tons of carbon emissions annually.⁸³ The plant is expected to generate 40,000 MW of renewable energy by 2022 and offset 400,000 tons Co2 by 2040, an equivalent of planting 200,000 trees.⁸⁴

The Art of Living, Karnataka

Overview: The Art of Living is a humanitarian and education-based NGO founded in 1981 by the guru Sri Sri Ravi Shankar. Their green measures include solar lighting, training centers for renewable energy, afforestation, rain water harvesting, sanitisation.

Description: In 2010, the Art of Living launched the 'Light a Home' campaign across India and has been working towards electrifying rural India through installation of solar lighting solution. It has distributed 23,000 solar lights in tribal areas across India, lighting nearly 20,000 homes and transforming the lives of 65,000 people. The organization has distributed 1,500 solar study lights to school children in Arunachal Pradesh, Manipur and Karnataka in 2016 and set up ten solar micro grids in the rural belt of West Bengal, Karnataka and Maharashtra. With 98 solar entrepreneurs created across India and 1,300 solar engineers trained to install and service home lighting systems, it has sought to transfer full ownership of distribution, installation and maintenance of the equipment in order to ensure the sustainability of the initiative.⁸⁵

In all, the Art of Living also has solar interventions in 113 government schools in India and 260 micro-battery charging stations, it's bio-energy interventions in the Bangalore ashram generated 100 litres of bio-gas a day, with 400 kg plastic and 500 kg briquette unit waste converted into fuel each day.

In 2016, a Sri Sri Kaushal Vikas Kendra for Renewable Energy, a skills training center, was opened in association with Schneider Electric, a global technology specialist in energy management, in Karnataka. The training center running under the Sri Sri Rural Development Program and an affiliate of Pradhan Mantri Kaushal Vikas Yojana (PMKVY), provides free technical training that could otherwise cost Rs. 50,000 – Rs. 75,000 (US\$ 750 – US\$ 1,125) commercially. The figure below shows that the trust has a number of vocational training centers offering similar services, not just in renewables.

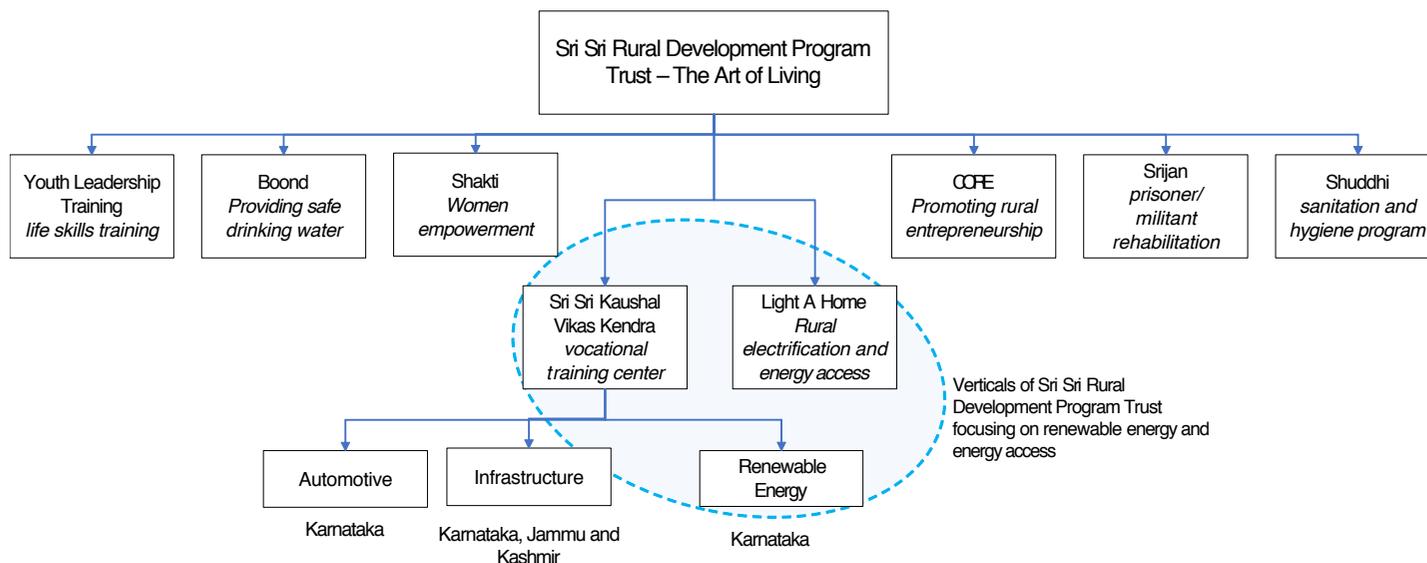
The center helps create *Urja Sevaks* (social entrepreneurs in solar business) to support the growing skill need in the commercial market. These Sevaks, are absorbed for employment and maintenance of the solar infrastructure installed in villages. Students are also encouraged and certified to become solar trainers to impart the solar training to others.

⁸³ <https://www.tatapowersolar.com/project/12-mw-rooftop-solar-power-system-rssb-ees-beas/>, accessed October 17, 2018.

⁸⁴ <https://www.hindustantimes.com/punjab/world-s-biggest-rooftop-solar-power-plant-inaugurated-at-radha-soami-dera-in-beas-by-cm-badal/story-VgCHxP3LbG5qCak5eFpNTP.html>, accessed October 17, 2018.

⁸⁵ <http://projects.artofliving.org/project/light-a-home-celebrating-diwali-everyday-in-villages-across-india/>, accessed October 17, 2018.

3. Art of Living's focus on renewables energy and energy access is focused on two of its eight rural development priority areas



Source: Art of Living website; PMKVY.

Schneider Electric and the Art of Living signed an MoU the same year to open 20 centers for electrical training and one state-of-the-art solar energy research and technology and training center at the Sri Sri University.⁸⁶

The Art of Living Foundation has contributed to many local projects across India. Their Jal Jagruti Abhiyaan, a project undertaken in 2013 to rejuvenate rivers and *nallahs* (rivulets) in a few districts of Maharashtra, primarily helps with de-silting activities. As of 2016, they worked on twelve rivers and nallahs in more than 150 villages spread across various districts in terms of de-silting and construction of cement bunds (embankments to prevent flooding of rivers) and gabion structures (basket-like structures made of rocks and concrete to help collect and store water).⁸⁷ In the state of Uttar Pradesh, they have worked towards improving sanitation hygiene and awareness by training 1,000 adults and 900 children through awareness camps and helped build 65 new toilets using partially sourced community funds.⁸⁸

The Art of Living Foundation also helps train local farmers in Bangalore in organic farming methods, water harvesting techniques and construction of small dams to store rainwater for use in non-rainy seasons.⁸⁹ Kapsi is one of 1,200 villages in Maharashtra that is transforming on many fronts due to the efforts put in by The Art of Living volunteers. It can now withstand two years of no rainfall with 28 check dams – 17 gabion structures and eleven underground structures – to collect and store rainwater, which has doubled its agricultural yield.⁹⁰

⁸⁶ <https://www.artofliving.org/in-en/skills-training-center-inaugurated-electrify-india-solar-power>, accessed October 17, 2018.

⁸⁷ <http://projects.artofliving.org/project/jal-jagruti-abhiyan/>, accessed October 17, 2018.

⁸⁸ <http://projects.artofliving.org/project/improving-sanitation-hygiene-and-awareness-in-suratganj/>, accessed October 17, 2018.

⁸⁹ Balachander, J. (2015), Green Temples Guide, p.25.

⁹⁰ <https://www.artofliving.org/kapsi-village-transformed>, accessed October 17, 2018.

3. Recommendations

1. Further Research

Additional research is required as a precondition to further develop the renewable energy and energy access efforts in the Indian religious sector. This research would identify best practices in the areas of: Education and awareness raising, Connecting religious institutions with solutions providers, Financing for deployment and scale.

We suggest a second study to be completed in 2019 which addresses these issues. This study should also include research into effective narratives to engage large numbers of Indian religious institutions in on-site and community-based renewable energy development, drawing upon findings from a study conducted by Climate Outreach on climate change communications in an Indian context⁹¹.

Finally, the study should include a section that seeks to evaluate interest levels among Indian religious institutions in relation to a campaign framework to accelerate their adoption of renewable energy solutions and their engagement with energy access initiatives.

2. Pilot Trainings

Using the findings from the second round of research, we recommend developing training materials to assist religious institutions in adopting renewable energy solutions, and testing these materials through pilot trainings in several regions of India. This process would enable the development of a group of Indian religious and spiritual leaders with a commitment to addressing these issues and the skills and support to do so. The ongoing development and activation of such a group of leaders is fundamental to the meaningful involvement of India's religious sector in addressing the country's climate and energy access challenges.

3. Convene leaders

Finally, we recommend a series of regional convenings that bring together interested leaders of Indian religious institutions with energy access and renewable energy social entrepreneurs. An agenda would be designed to: Introduce the work of social entrepreneurs in these fields to religious leaders, Identify opportunities for possible collaboration, Build relationships.

These consultations should take place in 2019, with the aim of developing recommendations for next steps in 2020 which can be announced in the lead-up to the United Nations climate negotiations that year, COP26. A steering committee with representatives from the religious and social entrepreneur sectors should be identified to advance planning, in collaboration with the Bhumi Project, GreenFaith, and the Shine campaign. If these convenings prove fruitful, they will result in the identification of locations and religious institutions that represent favourable sites for pilot renewable energy and energy access projects which might be analysed for replication or adapted for use in a wider range of communities.

⁹¹

<https://climateoutreach.org/resources/global-narratives-pilot-project-in-india/>

4. Conclusions

This study identifies key findings in relation to the engagement of India's religious sector in adopting renewable energy solutions and engaging energy access issues. It shows that this sector needs education and training in best practices in order to increase the number of Indian religious sites providing leadership in these vital areas, and provides insights about what the content of that training should be. The study also offers three interconnected recommendations to further the development of leadership by religious institutions across India.

India's religious sector represents a potentially powerful yet under-resourced and under-engaged force for change in relation to climate change and energy access. Supporting the emergence of leaders from this sector who offer a powerful response to these issues, will be of fundamental significance for India for decades to come.

5. Glossary

The following is a list of the abbreviations used in the report.

Abbreviation	Description
ADPM	Animal Driven Prime Movers
ARC	Alliance of Religions and Conservation
AMMA	Sri Mata Amritanandamayi Devi
CBO	Community Based Organizations
CII	Confederation of Indian Industry, India
Co2	Carbon Dioxide
CORD	Chinmaya Organization for Rural Development
GEEREF	Global Energy Efficiency and Renewable Energy Fund
GGEF	Green Growth Equity Fund
HUDCO	Housing & Urban Development Corporation Ltd.
IGBC	Indian Green Building Council
KVA	Kilo Volt Ampere
kWh	Kilowatt hour
KWP	Kilowatt peak
LED	Light-emitting diode
LPG	Liquefied petroleum gas
MNRE	The Ministry of New and Renewable Energy, Government of India
MW	Megawatt
MWh	Megawatt hour
MWp	Megawatt power
NGO	Non-Governmental Organization
Nm3	Normal Cubic Meter
NIIF	National Investment and Infrastructure Fund
PEDA	Punjab Energy Development Agency
PMKVY	Pradhan Mantri Kaushal Vikas Yojana
PV	Photovoltaics
Sq.m	Square Meter
SSST	Shri Saibaba Sansthan Trust
TTD	Tirumala Tirupati Devasthanam
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
WRST	World Renewal Spiritual Trust

6. Disclaimer

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