Bureau of Energy Efficiency
Government of India, Ministry of Power

STATE ENERGY EFFICIENCY ACTION PLAN

DADRA & NAGAR HAVELI AND DAMAN & DIU

Prepared by
Confederation of Indian Industry

Supported by
State Designated Agency
U.T of Dadra & Nagar Haveli and Daman & Diu

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Azadi Ka Amrit Mahotsav

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BUREAU OF ENERGY EFFICIENCY
(Ministry of Power, Government of India)

Foreword

The Bureau of Energy Efficiency (BEE), under the Ministry of Power, Government of India, has been actively working to promote energy efficiency across various sectors of the Indian economy through initiatives like the National Strategic Plan for Energy Efficiency and the National Mission ROSHANEE. These efforts align with India's commitment to doubling its energy efficiency improvement rate by 2030, as declared at the G20 summit.

To harness the vast potential for energy efficiency in sectors such as industry, buildings, agriculture, and transport, the State Energy Efficiency Action Plan (SEEAP) has been developed. SEEAP aims to establish clear state-wise focus areas and develop actionable strategies to mainstream energy efficiency interventions.

This report provides valuable insights for policymakers, government agencies, and other stakeholders to implement effective programs and achieve India's climate goals. It also serves as a platform for knowledge sharing and scaling up energy efficiency activities nationwide.

I am pleased to announce that most States/UTs have formed State Level Steering Committees (SLSCs) under the leadership of Chief Secretaries. These committees will play a crucial role in developing mechanisms to implement the identified action plans.

I encourage all stakeholders to review this document and contribute their valuable feedback to further enhance its effectiveness in promoting energy efficiency at the state level.

October, 2024

(Dr. Srikant Nagulapalli)

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PREFACE

The Bureau of Energy Efficiency (BEE) has been involved in numerous efforts aimed at developing and implementing energy efficiency programmes. As part of this initiative, BEE has proposed the above assignment, which aims to provide technical assistance for the identification of focus sectors for the “State Energy Efficiency Action Plan” in various states/UTs, to ensure that resources are allocated in accordance with state/UT requirements, and to estimate the potential of energy conservation in sectors that are prevalent in the region. The “State Energy Efficiency Action Plan” is sought in two parts: a 5-year short-term strategy and a long-term plan aimed at high-impact energy efficiency by FY 2030.

All states/UTs are grouped into six zones for this assignment: North-East, East, North-1, North-2, West, and South. In this context, the Bureau of Energy Efficiency (BEE), with the assistance of the Confederation of Indian Industry (CII), was involved in identifying major energy guzzling sectors in the West and South Zones, as well as reviewing all existing policies related to energy conservation, which will be presented in the form of this report "State Energy Efficiency Action Plan."

Policymakers, planners, domain consultants, and other important stakeholders would benefit from the State Energy Efficiency Action Plan. The report will also allow knowledge exchange among stakeholders and, in the long run, will help to scale up energy-efficiency programmes in their respective states.

ACKNOWLEDGEMENT

The Confederation of Indian Industry (CII) would like to express its sincere thanks to the Bureau of Energy Efficiency (BEE), Ministry of Power, Govt. of India for their role in guiding and steering this prominent assignment "UT-Energy Efficiency Action Plan" for Dadra and Nagar Haveli and Daman and Diu.

CII is grateful to Shri Srikant Nagulapalli, Director General, BEE, and Shri Milind Deore, Secretary, BEE, for their overall guidance and encouragement for successful completion of this project.

We are also thankful to Shri Abhishek Sharma, Joint Director, and Shri Vikash Kumar Jha, Project Engineer, with whom the team regularly consulted during the project for assistance, feedback, and valuable inputs.

CII is grateful to the proactive management of SDA-Dadra and Nagar Haveli and Daman and Diu for its role in guiding and steering this first task of this prestigious assignment and their support in coordination throughout the study.

CII team is also grateful to all the stakeholders, for showing keen interest and providing their wholehearted cooperation throughout the study.

EXECUTIVE SUMMARY

India's rapid economic expansion and urbanization have paved the way for a huge increase in energy demand. As the nation continues to evolve and urban areas expand, the need for energy to power industries, transportation, and households has grown steadily. This burgeoning demand poses a complex challenge, as it requires a delicate balance between providing access to affordable and reliable energy for all while addressing environmental sustainability and energy security. In response to these challenges, India, in its updated Nationally Determined Contribution submitted during the 26th session of the Conference of the Parties (COP26) to the United Nations Framework Convention on Climate Change (UNFCCC) in Glasgow, United Kingdom in 2021, unveiled a strategic framework for climate action. This framework, symbolized by the "Panchamrit" (five nectar) elements, signifies India's resolute commitment to achieve net-zero emissions by 2070 and secure 50% of its energy from renewable sources by 2030.

It is imperative to recognize the pivotal role that States and Union Territories (UTs) play in effecting a transition to low-carbon development pathways. To facilitate this vital transition, the Bureau of Energy Efficiency, operating under the aegis of the Ministry of Power, Government of India, has embarked on the development of State Energy Efficiency Action Plan (SEEAP). These plans are tailored to meet the distinctive requirements of each state, ensuring that resource allocation aligns with the state's sustainable development objectives. The SEEAP project aims to contribute to India's national targets and provide a comprehensive roadmap for enhancing energy efficiency across the state and the country.

For Dadra and Nagar Haveli and Daman and Diu, SEEAP was developed by the Confederation of Indian Industry (CII), under the guidelines of Bureau of Energy Efficiency, Ministry of Power, GOI, in consultation with the State Designated Agency viz. Dadra and Nagar Haveli and Daman and Diu with inputs & suggestions from various government departments and sector experts. The primary objective of the State Energy Efficiency Action Plan for Dadra and Nagar Haveli and Daman and Diu is to formulate sector-specific strategies in short-term 2025 and long-term 2030 goals for enhancing energy efficiency in the U.T.

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1. INTRODUCTION

1.1 Background

India is a diverse country with diverse energy consumption patterns in different states/UTs. Broadly, the energy consumption is divided in six major sectors i.e., **Buildings, Transportation, Municipalities, DISCOMs, Agriculture and Industries**. A need for a focussed sector-based energy efficiency approach by states/UTs has been felt. For instance, there may be states with lesser urbanised areas and therefore lesser number of high energy consumption buildings. Such a state may need more focus on energy efficiency in sectors such as Transportation, Agriculture, or others.

Similarly, Industry sector has 53% of total primary energy demand in India, and more than 30% in most States, however, the level of energy efficiency initiatives and programmes is not commensurate with the energy consumption in this sector. Most states are yet to set Energy saving potential for industry, apart from targets set for the PAT programme. Most states focus primarily on energy conservation for PAT Designated Consumers (DC) and monitor DCs for energy audits and compliance with specific energy consumption (SEC) targets. Only a few states have mandated energy audits for specific categories of industry other than PAT DCs and provision to provide financial incentives for implementing energy efficiency in industrial units.

In the transport sector, there is a need to include and promote energy efficient public transport besides policy level intervention for efficient or clean fuel vehicles. Several states have come forward with a state level incentivisation for Electric Vehicles. Policy and framework for electric vehicles at the state level needs further focus. Though energy efficiency is a multi-dimensional subject, defining key focus areas to bridge gaps is the need of the hour. While some states may have the potential to improve efficiency in a particular sector, there may be gaps in terms of identification of these sectors.

If, for instance, a state with many MSME industrial units, may focus on energy efficiency in the industrial sector alone, a large potential of achieving energy efficiency may be unearthed. This may involve activities and resource mobilization to create awareness in industry, replacement of appliances and machinery with the help of ESCOs, setting up and utilization of Revolving Investment Fund, besides others.

1.2 India's Nationally Determined Contributions (NDCs)

[1]The ambitious NDC from India makes a substantial contribution to fulfilling the objectives of the Paris Agreement. Efforts to reduce carbon emissions and preserve the environment are the foundation of all of India's major economic sectors. India reiterates its support for the Paris Agreement on Climate Change and the UNFCCC. India submitted its Intended Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC) on October 2, 2015, in accordance with resolution 1/CP.20. India's existing NDC is a step forward towards long term goal of reaching net-zero by 2070.

Accordingly, India has updated its first NDC submitted earlier on October 2, 2015, for the period up to 2030-31, in conformity with the a fore mentioned provision of the Paris Agreement read with pertinent decisions, as follows:

- "India will put forward and propagate a healthy and sustainable way of living based on its traditions and the values of conservation and moderation, including through a mass movement for LIFE, as a key to combating climate change." Energy used, water saved, single use plastic reduced, sustainable food system adopted, waste reduced, healthy lifestyle adopted, and E-waste reduced, are the 7 actions fall under the Mission Life 2022-23[2].
- To adopt a climate friendly and a cleaner path than the one followed hitherto by others at corresponding level of economic development.
- To reduce Emissions Intensity of its GDP by 45 percent by 2030-31, from 2005 level.
- To achieve about 50 percent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030-31, with the help of transfer of technology and low-cost international finance including from Green Climate Fund (GCF).
- To create an additional carbon sink of 2.5 to 3 billion tonnes of CO2 equivalent through additional forest and tree cover by 2030-31.
- To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture, water resources, Himalayan region, coastal regions, health, and disaster management.
- To mobilize domestic and new & additional funds from developed countries to implement the above mitigation and adaptation actions in view of the resource required and the resource gap.
- To build capacities, create domestic framework and international architecture for quick diffusion of cutting-edge climate technology in India and for joint collaborative R&D for such future technologies.

1.3 About State Energy Efficiency Action Plan

[1]https://unfccc.int/sites/default/files/NDC/202208/India%20Updated%20First%20Nationally%20Determined%20Contrib.pdf

[2] https://www.niti.gov.in/sites/default/files/2022-10/Brochure-10-pages-op-2-print-file-20102022.pdf

This assignment aims to provide technical assistance for the identification of focus sectors for the **State Energy Efficiency Action Plan for UT of Dadra & Nagar Haveli and Daman & Diu** to ensure that the allocation of resources is as per the requirement of state and estimate the potential of energy conservation in sectors which are predominant in the region. The State Energy Efficiency Action Plan is sought in two parts, a short term-plan for a tenure of 5 years and a long-term plan targeting high impact energy efficiency by the year 2030-31.

The above said objective will be achieved by completion of four tasks as given below.

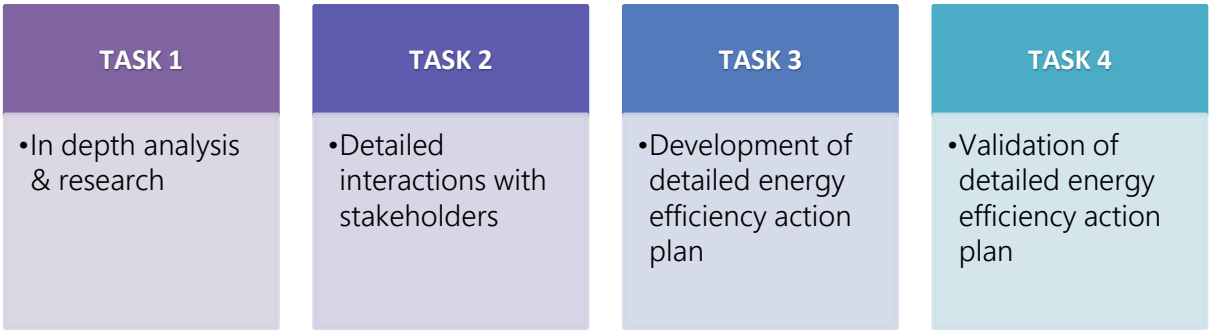

Figure 1 Key tasks in state energy action plan

Outcome

Task wise outcome of the study is as detailed in Figure 2.

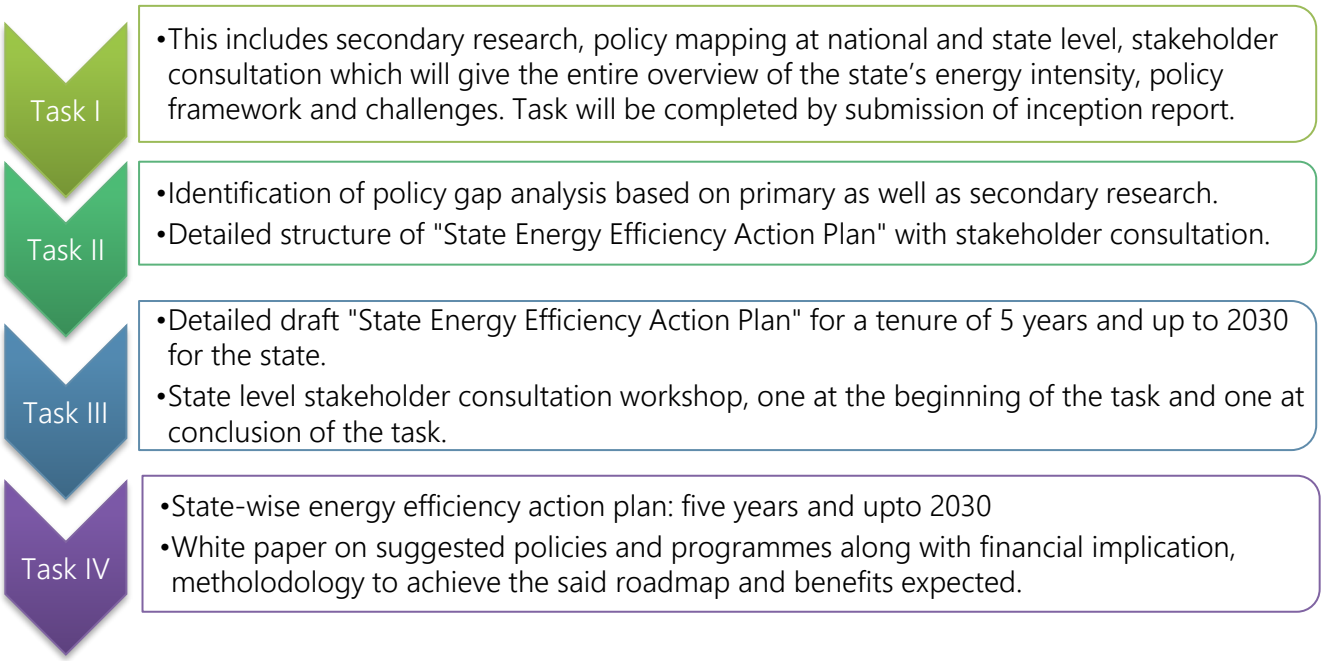

Figure 2 Task wise expected outcome of the study

Energy efficiency drivers for state

Dadra and Nagar Haveli and Daman and Diu have developed various programs including Energy efficiency initiatives like LED village campaign, Two lane and Four lane LED replacement, Publicity and awareness program. SDA Daman and Diu established Energy Club in 5 school and Work in Progress for Establishment of "Energy Clubs" in more Schools and Polytechnic College to promote awareness on Energy Conservation. State also organised the awareness workshops for retailers, farmers, industries, DSM. Transition to non-fossil fuel-based energy is the key driver for the UT's Solar power. Few key drivers are illustrated in Figure 3.

- Advancement in Technology
- Customer stakeholders pull
- Sustainability factor
- New Investment opportunities
- Policy Push

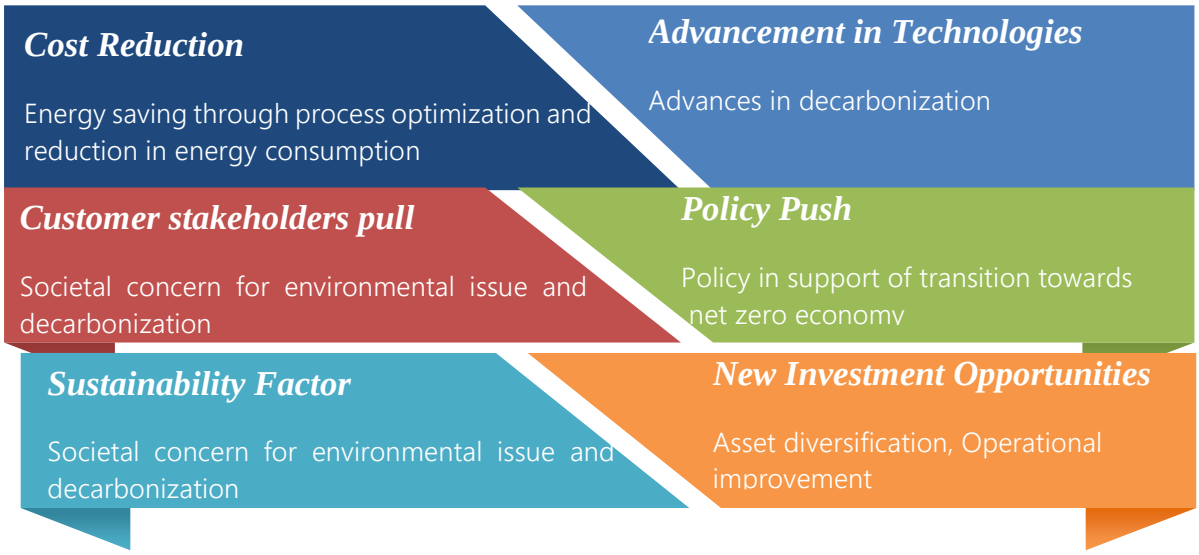

Figure 3 Energy efficiency drivers of the state

1.4 Dadra and Nagar Haveli and Daman and Diu State Profile

Dadra and Nagar Haveli and Daman and Diu are a union territory in India. The area of Dadra Nagar Haveli spread over 491.00 Sqr.KM and landlocked between Gujarat in North and Maharashtra in South was liberated from Portuguese Rulers by people themselves on 2nd August 1954.The union territory was merged with the neighbouring union territory of Daman and Diu to form the new union territory of Dadra and Nagar Haveli and Daman and Diu on January 26, 2020. The territory of Dadra and Nagar Haveli then became one of the three districts of the new union territory, as the Dadra and Nagar Haveli District.[3]

Daman is on mainland near southern portion of Gujarat State. Vapi is the nearest Railway Station (13 kms) which is on Western Railway between Mumbai and Surat. Vapi is 167 kms from Mumbai Central and 95 kms from Surat. Diu is an island near Una of Junagarh District in Gujarat State. Nearest Railway Station is Delwada at the distance of 9 kms from Diu. But important trains are linked with Veraval which is 90 kms from Diu. portion of Diu District is on mainland which is named as Ghoghla. A small part of Diu known as Simbor is situated in Gujarat at a distance of 25 kms from Diu.[4]

1.5 Current Energy Scenario of UT

1.5.1 Primary Energy Supply

[3] https://dnh.gov.in/district-profile/

[4] https://cdnbbsr.s3waas.gov.in/s371e09b16e21f7b6919bbfc43f6a5b2f0/uploads/2023/01/2023011241.pdf

In primary energy, UT has consumed majorly oil, and few amount of natural gas. It has no coal consumption. The total oil consumption (MTOE) of Dadra and Nagar Haveli and Daman and Diu is shown in Table 11. The breakup of total oil consumption in various sectors such as Industries, Agriculture, Building and others have been arrived based on breakup of oil consumption in Crisil report.

Table 1 Total oil consumption of Dadra and Nagar Haveli and Daman and Diu

Total Oil consumption of Dadra and Nagar Haveli and Daman and Diu (MTOE)					
SECTOR	**FY 15-16**	**FY 16-17**	**FY 17-18**	**FY 18-19**	**FY 19-20**
INDUSTRIAL	0.08	0.09	0.09	0.09	0.08
AGRICULTURE	0.01	0.01	0.01	0.01	0.01
RESIDENTIAL	0.03	0.04	0.04	0.04	0.03
COMMERCIAL	0.02	0.03	0.02	0.02	0.02
OTHER	0.02	0.02	0.02	0.02	0.02
TRANSPORT	0.33	0.39	0.38	0.37	0.32
GRAND TOTAL	**0.49**	**0.58**	**0.56**	**0.55**	**0.47**

1.5.2 Oil Consumption trend in Daman and Diu (in MTOE)

Oil consumption in Daman and Diu has increased at a CAGR of 2.4 % over the year FY 15-16 to FY 19-20. The Figure 44 depicts the energy supplied by primary fuels from FY 2016 to FY 2020 in Daman and Diu[5].

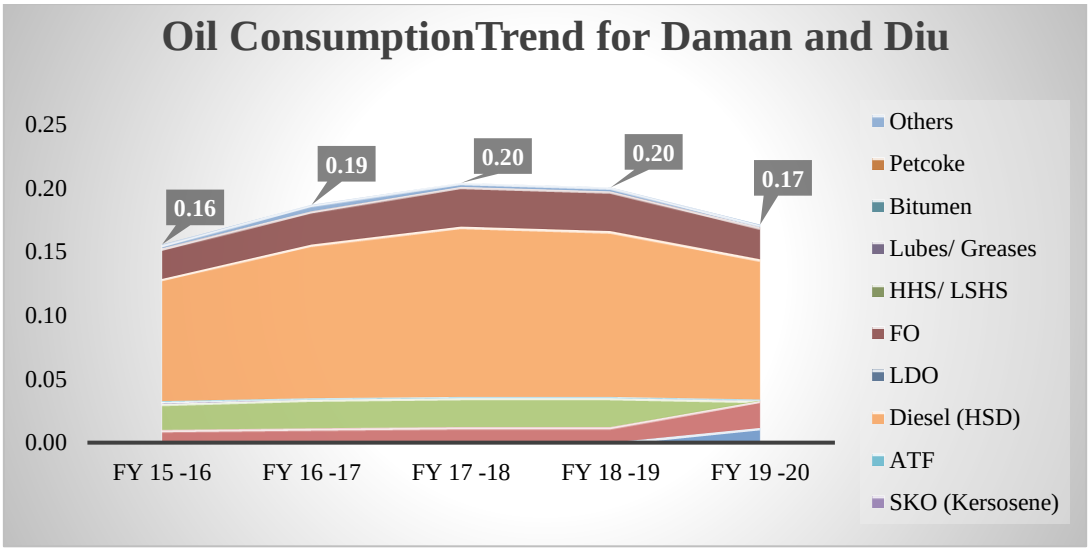

Figure 4 Category wise oil consumption trend for Daman and Diu

1.5.3 Gas Consumption trend in Daman and Diu (in TOE)

Gas Consumption in Daman and Diu has increased at a CAGR of 5.13 % over the year FY 15-16 to FY 19-20 as shown below

5 Indian Petroleum & Natural Gas Statistics 2019-20.

Table 2 Gas consumption for Daman and Diu for FY 15-16 to FY 19-20

Daman and Diu (in TOE)				
	CNG	**Domestic**	**Commercial**	**Industrial**
FY 15-16	5435.65	508.25	414.35	5851.22
FY 16-17	5764.73	539.02	439.44	6205.46
FY 17-18	6124.22	572.63	466.84	6592.43
FY 18-19	6292.54	588.37	479.67	6773.61
FY 19-20	6639.02	620.77	506.08	7146.59

1.5.4 Oil Consumption trend in Dadra and Nagar Haveli (in MTOE)

Oil consumption in Dadra and Nagar Haveli has decreased at a CAGR of 2.9 % over the year FY 15-16 to FY 19-20. The figure 5 shows the energy supplied by primary fuel i.e., oil from FY 2016 to FY 2020 in Dadra & Nagar Haveli[6].

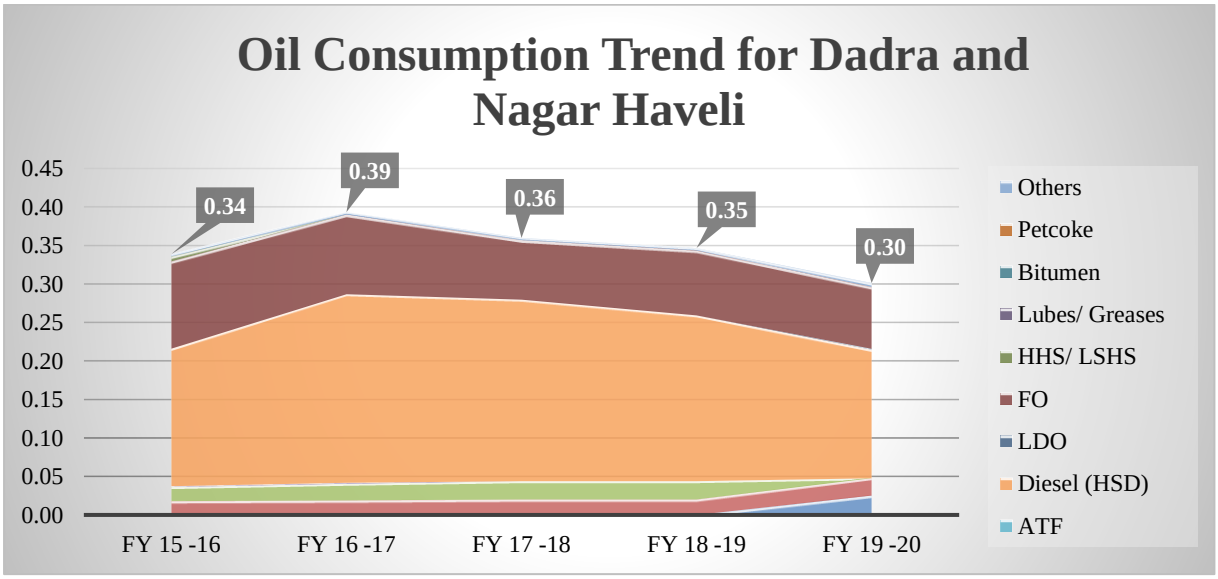

Figure 5 Category wise oil consumption for Dadra and Nagar Haveli

1.5.5 Gas Consumption trend in Dadra and Nagar Haveli (in TOE)

Gas Consumption in Dadra and Nagar Haveli has increased at a CAGR of 5.13 % over the year FY 15-16 to FY 19-20 as shown in

Table 33

Table 3 Gas consumption for Dadra and Nagar Haveli for FY 15-16 to FY 19-20

Dadra and Nagar Haveli
Values in TOE

6 Indian Petroleum & Natural Gas Statistics 2019-20.

	CNG	Domestic	Commercial	Industrial
FY 15-16	3488.22	629.41	162.73	22708.99
FY 16-17	3699.40	667.51	172.58	24083.81
FY 17-18	3930.09	709.14	183.35	25585.68
FY 18-19	4038.11	728.63	188.39	26288.87
FY 19-20	4260.46	768.75	198.76	27736.41

1.5.6 Electricity Sub-sector

Electricity Sub-sector Dadra and Nagar Haveli and Daman and Diu

Dadra and Nagar Haveli and Daman and Diu Power Distribution Corporation Limited (DNHDDPDCL)[7] is an integrated utility having functions of supply of electricity (i.e. 11 kV and below) in U.T. of DNH and DD. As the U.T. does not have its own generation (except small Solar) and completely rely on the Central Sector Generating Stations (CSGS) in Western Region to meet its energy demand and Eastern Region Central Generating Stations.

Currently, Torrent power has formally takeover of the power distribution operations in the U.T. of Dadra and Nagar Haveli and Daman and Diu, which is the first Union Territory where the electricity supply and distribution has been privatised. In this takeover Torrent Power[8] will own 51% stake and the administration of the U.T. of Dadra and Nagar Haveli and Daman and Diu will own 49% stake.

Sector wise electricity consumption Daman and Diu

The electricity consumption by the major sectors of Daman and Diu[9] for FY19-20 is shown in Figure 6. The total electricity consumption of **Daman and Diu** as of FY 19-20 is 2495.67 MU.

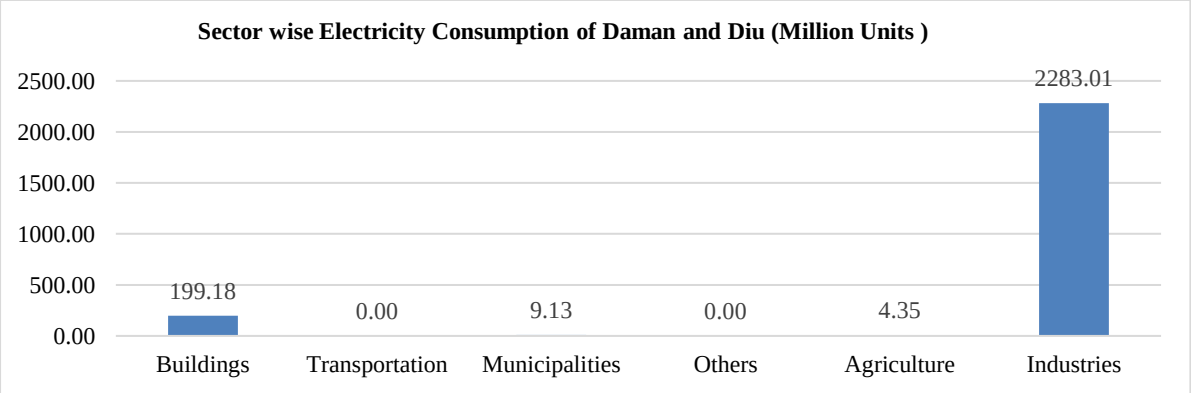

Figure 6 Sector wise Electricity Consumption of Daman and Diu

Industries is the largest electricity consumer in the UT consumes about 2,283.01 MU of electricity as of FY 2019-20. Buildings consumed 199.18 MU followed by Municipalities, consumed 9.13 MU, Agriculture, consumed 4.35 MU as shown in Table 4. Streetlights and pumps are major energy consumers in Municipal and Agriculture sector respectively.

7 https://dded.gov.in/detail.php?id=7

8https://indianexpress.com/article/cities/ahmedabad/torrent-power-to-supply-power-in-dadra-nagar-haveli-daman-diu-7847800/

9 Aggregate Revenue Requirement (ARR) Report for Daman and Diu of 2021-22

Table 4 Sector wise break up of electricity consumption of Daman and Diu (in MU)

Category	FY 15-16	FY 16-17	FY 17-18	FY 18- 19	FY 19-20
Buildings	138.22	153.36	179.16	187.74	199.18
Transportation	0	0	0	0	0
Municipalities	10.11	11.11	12.97	11.94	9.13
Others	1.23	2.17	0	0	0
Agriculture	2.46	2.81	4.83	4.95	4.35
Industries	1539.95	1587.66	1904.24	2229.3	2283.01
Total	**1691.97**	**1757.11**	**2101.2**	**2433.93**	**2495.67**

Sector wise break up of electricity consumption in Tonnes of Oil Equivalent (TOE) for **Daman and Diu** is shown in the Table *5* 5.

Table 5 Sector wise break up of electricity consumption of Daman and Diu (in TOE)

Category	FY 15-16	FY 16-17	FY 17-18	FY 18- 19	FY 19-20	CAGR Growth Rate
Buildings	11886.92	13188.96	15407.76	16145.64	17129.48	9.56%
Transportation	0	0	0	0	0	
Municipalities	869.46	955.46	1115.42	1026.84	785.18	-2.52%
Others	105.78	186.62	0	0	0	
Agriculture	211.56	241.66	415.38	425.7	374.1	15.32%
Industries	132435.7	136538.8	163764.6	191719.8	196338.9	10.34%
TOTAL	**145509.4**	**151111.5**	**180703.2**	**209318**	**214627.6**	10.20%

As of FY 19-20 Industrial sector of Daman and Diu is the most significant electricity consumer which consumed about 91.5% of the total electricity consumption in the UT. Building consumed 7.98% of electricity and remining 0.54% is consumed by Municipal and Agricultural.

Sector wise electricity consumption Dadra and Nagar Haveli

The electricity consumption in MU by the major sectors of **Dadra and Nagar Haveli** [10]for FY 2020 is shown in Figure *7*7.

10 Annual Recurring Revenue (ARR) Report for Dadra and Nagar Haveli of 2021-22

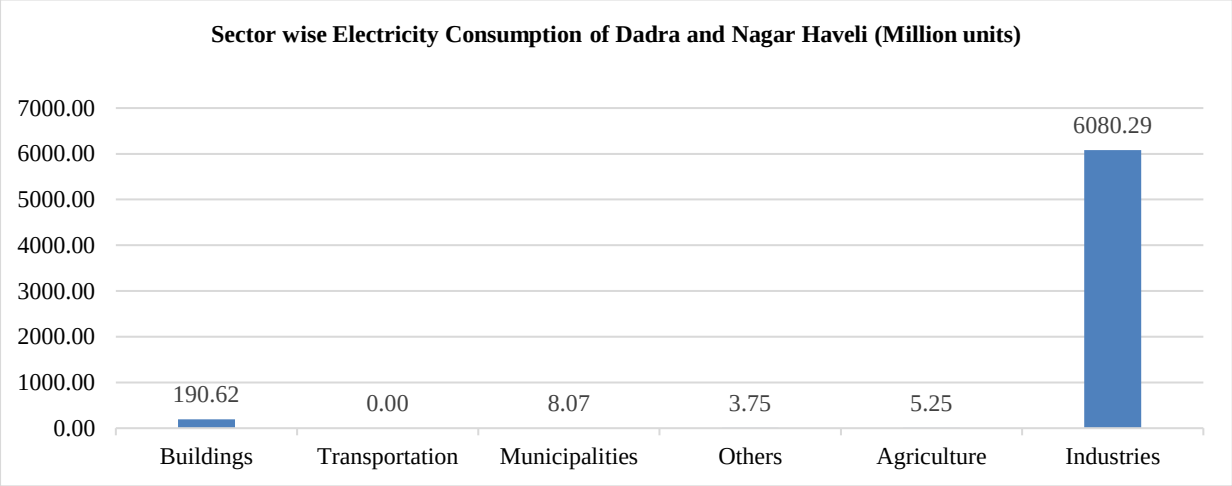

Figure 7 Sector wise Electricity Consumption of Dadra and Nagar Haveli

Trend in electricity consumption (Million units) from FY15-16 to FY 19-20 for Dadra and Nagar Haveli is shown in the Table 66. The overall electricity consumption of Dadra and Nagar Haveli is 6,287.98 MU as of 2019-20. Major consumer of electricity is industry which consumed 6,080 MU, followed by building sector consumption of 190.62 MU, Municipal consumption of 8.07 MU, Agricultural consumption of 5.25 MU and others consumed 3.75 MU.

Table 6 Sector wise break up of electricity consumption of Dadra and Nagar Haveli (in MU)

Category	FY 15-16	FY 16-17	FY 17-18	FY 18- 19	FY 19-20
Buildings	130.3	134.82	149.63	162.8	190.62
Transportation	0	0	0	0	0
Municipalities	11.02	12.82	13.42	12.04	8.07
Others	2.95	3.2	3.39	3.43	3.75
Agriculture	5.77	6.20	6.50	7.23	5.25
Industries	4622.36	3595.87	5503.37	5886.92	6080.29
Total	**4772.4**	**3752.91**	**5676.31**	**6072.42**	**6287.98**

Sector wise break up of electricity consumption in Tonnes of Oil Equivalent (TOE) for Dadra and Nagar Haveli is shown in the Table 77

Table 7 Sector wise break up of electricity consumption of Dadra and Nagar Haveli (in TOE)

Category	FY 15-16	FY 16-17	FY 17-18	FY 18- 19	FY 19-20	CAGR Growth Rate
Buildings	11205.8	11594.52	12868.18	14000.8	16393.32	10%
Transportation	0	0	0	0	0	0%
Municipalities	947.72	1102.52	1154.12	1035.44	694.02	-7%
Others	253.7	275.2	291.54	294.88	322.5	6%
Agriculture	496.22	533.2	559	621.78	451.5	-2%
Industries	397523	309244.8	473289.8	506275.1	522904.9	7%

TOTAL	**410426.4**	**322750.2**	**488162.64**	**522228**	**540766.2**	7%

As of FY 19-20, Industrial sector of Dadra and Nagar Haveli is the most significant electricity consumer and contributed to 96.7% of overall electricity consumption followed by 3% consumption in building sector.

1.5.7 Renewable Energy (RE) Capacity

Renewable Energy in Daman and Diu

Daman and Diu [11]has installed solar power of 20 MW as shown in Table *8*8 as on 19-20. Over the last five years installed capacity increased from 5.35 MW in 2016 to 19.86 MW in 2020 and provided growth of 39% CAGR over the year from 2016 to 2020.

Table 8 Daman and Diu: Renewable Energy (RE) installed capacity (MW), Generation (GWh) and Losses (%)

Renewable Energy by Capacity		
Financial Year	**Category**	**Capacity (in MW)**
2016	Solar	5.35
2017	Solar	12.77
2018	Solar	13.595
2019	Solar	15.227
2020	Solar	19.859
	CAGR	**39%**

Renewable Energy in Dadra and Nagar Haveli

Dadra and Nagar Haveli [12]has installed solar power capacity of 5 MW as of FY19-20, grew at CAGR of 19% over the year 2017 to 2020 as shown in the Table *9*9

Table 9 Dadra and Nagar Haveli Renewable Energy (RE) installed capacity (MW)

Renewable Energy by Capacity		
Financial Year	**Category**	**Capacity (in MW)**
2017	Solar	3
2018	Solar	5
2019	Solar	5
2020	Solar	5
	CAGR	**19%**

[11] Daman and Diu

[12] Niti Aayog Dashboard (India Energy Dashboards - Renewable Electricity Generation (niti.gov.in))

Renewable Energy (RE) Generation

Daman and Diu

In Daman and Diu, installed capacity has increased, which increased the contribution of solar power in overall energy consumption of the Daman and Diu. As of FY 19-20, Solar power contributed to 21.69 GWh[13] of generation as shown in Table 10.

Table 10 Daman and Diu Renewable Energy (RE) (GWh)

Renewable Energy by Generation		
Financial Year	**Category**	**Generation (in GWh)**
2016	Solar	4.42
2017	Solar	14.48
2018	Solar	18.63
2019	Solar	19.02
2020	Solar	21.69
	CAGR	**49%**

Total electricity consumption of the Daman and Diu as of FY19-20 is 2495.6 GWh and solar contributed 21.69 GWh. Hence, renewable energy (solar) contributed to 0.87% in overall electricity consumption of the UT.

Dadra and Nagar Haveli

In Dadra and Nagar Haveli, installed capacity has increased, which increased the contribution of solar power in overall energy consumption of the Dadra and Nagar Haveli. As of FY 19-20, Solar power contributed to 6.18 GWh[14] of generation as shown in Table *11*11.

Table 11 Dadra and Nagar Haveli Renewable Energy (RE) (GWh)

Renewable Energy by Generation		
Financial Year	**Category**	**Generation (in GWh)**
2016	Solar	0.5
2017	Solar	1.31
2018	Solar	5.24
2019	Solar	5.38
2020	Solar	6.18
	CAGR	**87.50%**

Total electricity consumption as of FY 20 is 6287.98 GWh which include solar electricity generation of 6.18 GWh. Hence, renewable energy (solar) contributed to 0.098% in overall energy.

13 NITI Aayog *Dashboard*
14 Niti Aayog Dashboard

1.6 Total Final Energy Consumption (TFEC)

1.6.1 Total Final Energy Consumption Dadra and Nagar Haveli and Daman and Diu

The sector wise total final energy consumption (TFEC) for Dadra and Nagar Haveli and Daman and Diu from electricity15 and fuels for FY15-16 to FY 19-20 is shown in Figure 8 Sector wise TFEC for Dadra and Nagar Haveli and Daman and Diu from FY15-16 to FY 19-20

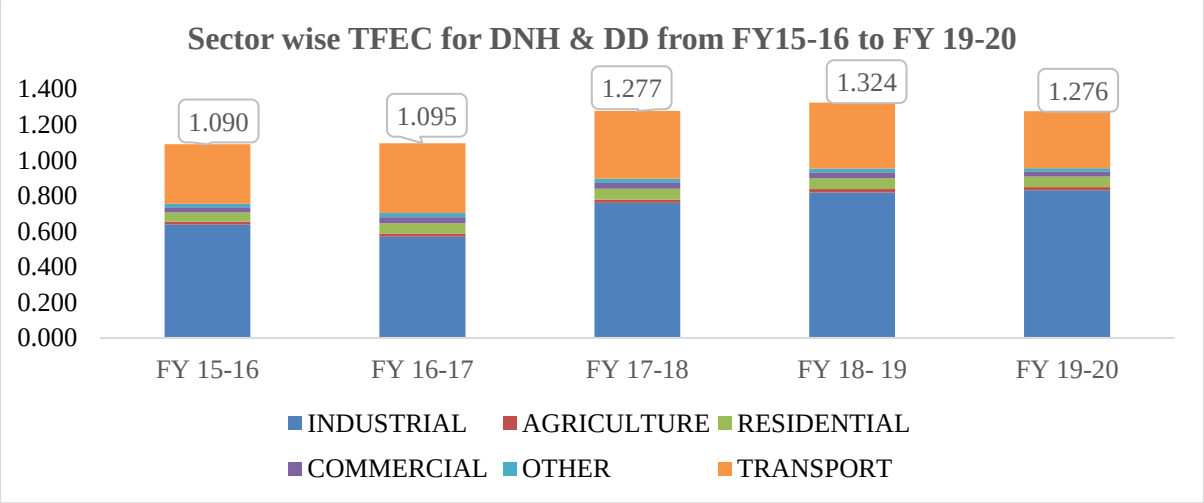

Figure 8 Sector wise TFEC for Dadra and Nagar Haveli and Daman and Diu from FY15-16 to FY 19-20

The Total Final Energy (Electricity & Oil) Consumption (TFEC) of Dadra and Nagar Haveli and Daman and Diu is 1.276 MTOE in FY 19-20 which includes TFEC of 0.401 MTOE for Daman and Diu and TFEC of 0.875 MTOE for Dadra and Nagar Haveli.

Table 12 Sector wise break up of TFEC for Dadra and Nagar Haveli and Daman and Diu from FY15-16 to FY 19-20

TFEC of Dadra and Nagar Haveli and Daman and Diu					
Sectors	**FY 15-16**	**FY 16-17**	**FY 17-18**	**FY 18- 19**	**FY 19-20**
Industrial	0.638	0.569	0.760	0.819	0.830
Agriculture	0.017	0.019	0.019	0.019	0.019
Residential	0.051	0.058	0.060	0.061	0.059
Commercial	0.029	0.034	0.033	0.032	0.029
Other	0.020	0.023	0.023	0.022	0.019
Transport	0.335	0.393	0.382	0.371	0.320
Total	**1.090**	**1.095**	**1.277**	**1.324**	**1.276**

The overall energy consumption has shown an increasing trend over the year from FY15-16 to FY 18-19 except the year FY 19-20. The decrease in energy consumption in FY 19-20 is due to a decrease in energy consumption in all the sectors except industry. The energy consumption in the year FY 19-20 decreased by 3.65% compared to year FY 18-19.

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Separate energy consumption of Dadra and Nagar Haveli and Daman and Diu are discussed in detail in the subsequent section.

1.6.2 Total Final Energy Consumption and sector wise break up of Daman and Diu

The sector wise total energy consumption (TFEC) for Daman and Diu from electricity16 and fuels for FY15-16 to FY 19-20 is shown in Figure 9 and Table 13

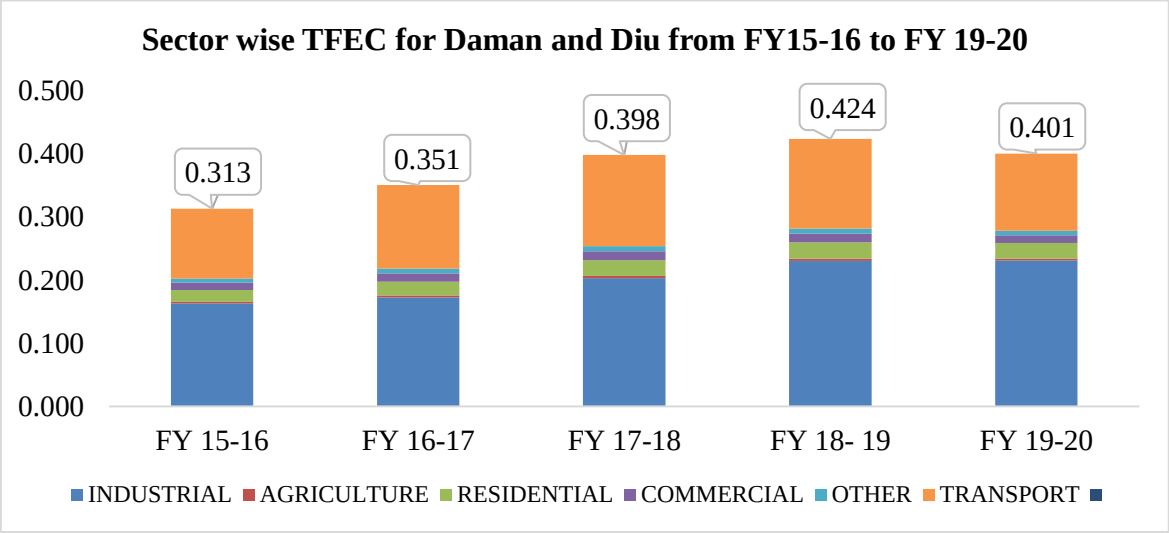


Figure 9 Sector wise TFEC for Daman and Diu from FY15-16 to FY 19-20

The Total Final Energy (Electricity & Oil) Consumption (TFEC) for Daman and Diu is 0.401 MTOE in FY 19-20 The overall energy consumption of the Daman and Diu is increased by CAGR of 6.34 % over the year FY 15-16 to FY 19-20.

Table 13 Sector wise break up of TFEC for Daman and Diu from FY15-16 to FY 19-20

TFEC of Daman and Diu (MTOE)					
SECTOR	**FY 15-16**	**FY 16-17**	**FY 17-18**	**FY 18- 19**	**FY 19-20**
INDUSTRIAL	0.163	0.173	0.203	0.231	0.231
AGRICULTURE	0.002	0.003	0.003	0.003	0.003
RESIDENTIAL	0.019	0.022	0.025	0.026	0.025
COMMERCIAL	0.012	0.013	0.014	0.014	0.012
OTHER	0.006	0.008	0.008	0.008	0.007
TRANSPORT	0.111	0.132	0.144	0.142	0.123
Total	**0.313**	**0.351**	**0.398**	**0.424**	**0.401**

Industry is the largest consumer of energy in the UT & consumed about 0.231 MTOE of total energy and contributed to 58% in overall energy consumption in FY 20. Transport sector is second largest consumer of energy and consumed 0.142 MTOE and contributing to 30% of energy and followed by Building sector consumed 0.025 MTOE of energy and contributed to 9% in overall energy consumption as shown in Figure 1010.

16 ARR Report of DD and DNH of 2021-22

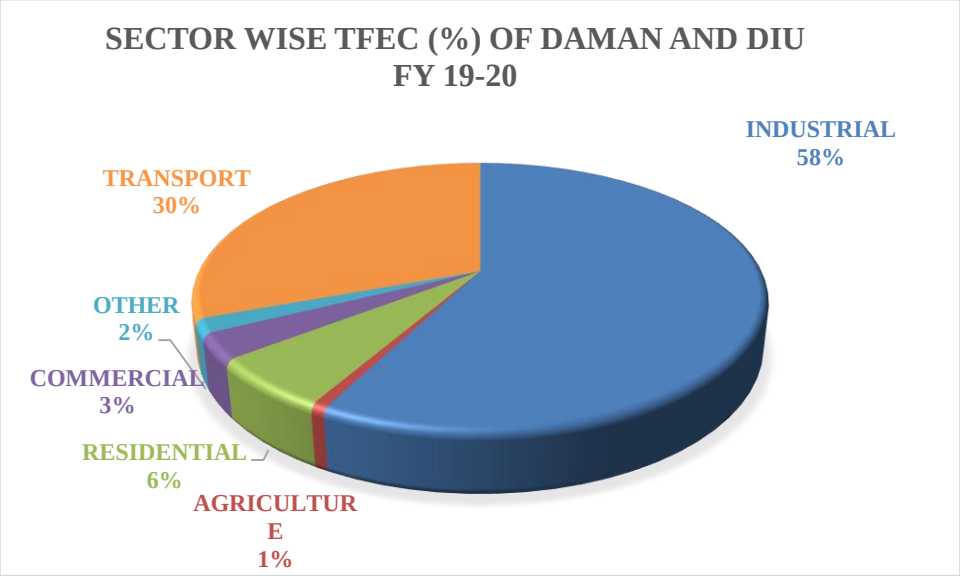


Figure 10 Sector wise TFEC (%) of Daman and Diu FY 19-20

1.6.3 Total Final Energy Consumption and sector wise break up of Dadra and Nagar Haveli

The sector wise total energy consumption (TFEC) for Dadra and Nagar Haveli from electricity and fuels (oil and gas) from FY15-16 to FY 19-20 is shown in Figure 11 and 14

The Total Final Energy (Electricity & Oil) Consumption (TFEC) for Dadra and Nagar Haveli is 0.875 MTOE in FY 19-20. The overall energy consumption of the UT is increased by CAGR of 3.04% over the year FY 15-16 to FY 19-20.

Table 14

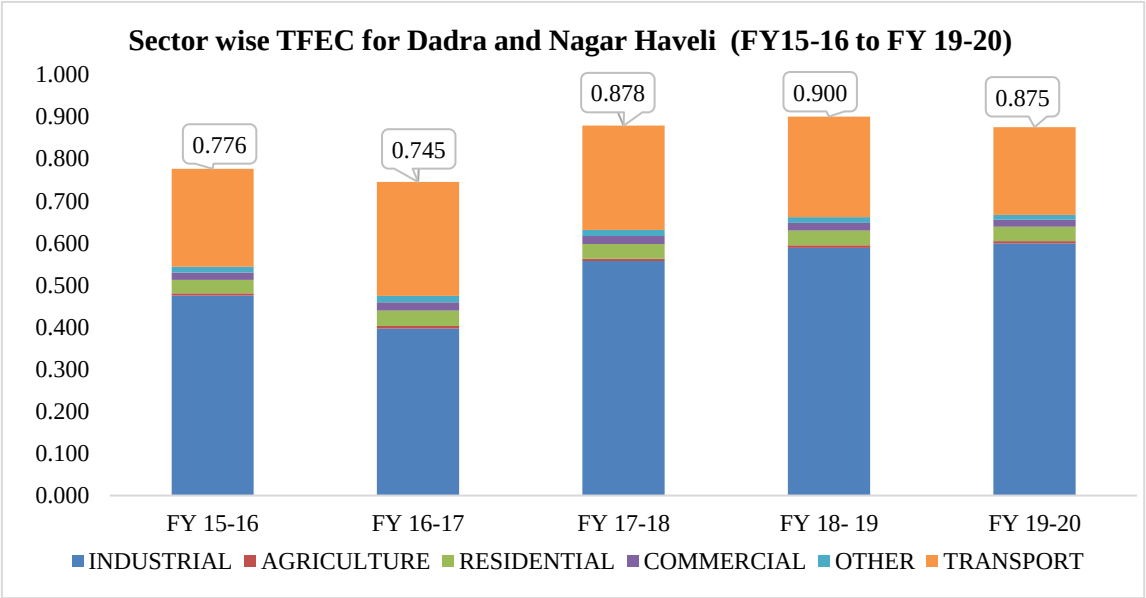


Figure 11 Sector wise TFEC for Dadra and Nagar Haveli from FY15-16 to FY 19-20

The Total Final Energy (Electricity & Oil) Consumption (TFEC) for Dadra and Nagar Haveli is 0.875 MTOE in FY 19-20. The overall energy consumption of the UT is increased by CAGR of 3.04% over the year FY 15-16 to FY 19-20.

Table 14 Sector wise break up of TFEC for Dadra and Nagar Haveli from FY15-16 to FY 19-20

TFEC of Dadra and Nagar Haveli (MTOE)					
SECTOR	**FY 15-16**	**FY 16-17**	**FY 17-18**	**FY 18- 19**	**FY 19-20**
INDUSTRIAL	0.475	0.397	0.557	0.588	0.599
AGRICULTURE	0.005	0.006	0.006	0.006	0.005
RESIDENTIAL	0.032	0.036	0.035	0.035	0.034
COMMERCIAL	0.018	0.020	0.019	0.018	0.017
OTHER	0.013	0.015	0.014	0.014	0.012
TRANSPORT	0.233	0.270	0.248	0.239	0.208
GRAND TOTAL	**0.776**	**0.745**	**0.878**	**0.900**	**0.875**

Industry is the largest energy consumer in the Dadra and Nagar Haveli and consumes about 0.599 MTOE of energy followed by consumption in transport and building sector. Transport sector consumed 0.208 MTOE of energy while building sector energy consumption stands at 0.051 MTOE as of FY 19-20.

In FY 19-20, Industries, Transport & Building contributed 68%, 24% & 6% of total energy consumption respectively as illustrated in Figure 122.

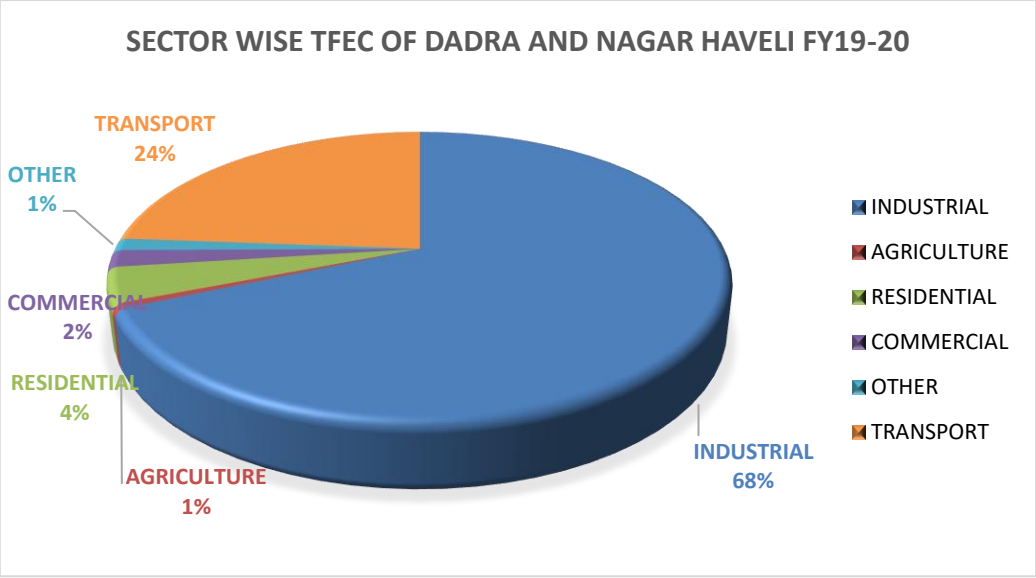


Figure 12 Sector wise TFEC of Dadra and Nagar Haveli FY19-20

1.7 Overview of Institutional framework

Dadra and Nagar Haveli and Daman and Diu Power Distribution Corporation Limited (DNHDDPDCL) is an integrated utility having functions of both distribution and retail supply (11 KV and below) for U.T. and it does not have its own generation.

Electricity department Daman and Diu and DNHDDPCL is responsible for regulating/controlling of all the power & energy related activities, distribution and retail supply of electricity (above 11 KV) in U.T. of DNH & DD. ED-DD has been designated as the State Designated Agency (SDA) and notified by U.T. as per the provisions of Energy Conservation Act 2001. SDA co-ordinates and co-operates with Bureau of Energy Efficiency, MoP, GoI at the central level to ensure a smooth and speedy

Implementation of the Energy Conservation Act (EC) 2001 at the grass root level. It plays the role of a developmental agency, a facilitator, and a regulator/ enforcing body.

State Designated Agency, (SDA) of Daman and Diu is responsible for the development and implementation of Energy conservation Action Plan (ECAP). It plays an important role in creating public awareness and enforcement of the EC Act, 2001 at the grass root level. As an agency, it oversees the energy efficiency initiatives of BEE and ensures that the ambitious targets are met.

The major responsibilities include coordination, regulation and enforcing the various provision of the Act in the State/UT level. As an agency, it is in charge of carrying out the energy efficiency initiatives of BEE and to achieve the ambitious targets set forth. The Source of power transmission of Dadra and Nagar Haveli and Daman and Diu as shown in Table *15*15

Table 15 Power Transmission for Dadra and Nagar Haveli and Daman and Diu

Source of Power Transmission	Daman and Diu[17]	Dadra and Nagar Haveli[18]
First Source	400/220 kV (D/C) Ambethi – Magarwada line	400/220 kV substation of PGCIL Vapi
Second Source	400/220 kV (D/C) Magarwada, (PGCIL)Magarwada	400/220 kV Kala substation of PGCIL
Third Source	66 kV Una Substation through 66 kV Double circuit Line emanating from 220/66 kV Kansari Substation of GETCO.	220 kV Switching station at Sayli and New Kharadpada

2 IDENTIFICATION OF FOCUS SECTORS

2.1 Identified focus sectors

Energy consumption indicators and situation assessment are used to define target focus sectors and specific industries.

The following sectors should be focused for the development of "Energy Efficiency Action Plan" for **DNH&DD**.

17 https://dded.gov.in/detail.php?id=6#:~:text=Power%20supply%20to%20the%20Daman,66%20kv%20Transmission%20lines%20network%20.

18 http://jercuts.gov.in/writereaddata/UploadFile/Tariff%20Petition%20DNH%20(Transmisson)%201718_1116.pdf

Energy efficiency measures are thus becoming increasingly significant in these sectors, based not just on overall energy use but also on the potential for cost-effective improvements. For setting priorities, account has to be taken of the measures applicable in a given sector (including cost implications) and on the means of promoting energy efficiency action.

3 PROJECTIONS AND FORECASTING

The Kaya identity is a useful equation for calculating the total amount of anthropogenic carbon dioxide (CO2) emissions. The equation, which is based on information that is easily accessible, can be used to calculate current emissions as well as how the important variables must evolve through time in relation to one another in order to achieve a target level of CO2 emissions in the future. The identity has been utilised and is still crucial in the discussion of international climate policy choices.

The Kaya identity states the total emission level of CO2 as the product of four factors:

$F = P \times (G/P) \times (E/G) \times (F/E)$

where: F = Global CO2 emissions from human sources

P = Global population

G = Global Gross Domestic Product (GDP)

E = Energy consumption

The equation identity was developed by Yoichi Kaya, the identity is a specific application of the I = PAT identity, which relates human impact on the environment (I) to the product of population (P), affluence (A) and technology (T). On first inspection, the Kaya identity may appear to be a frivolous equation given its construction as cancelling terms leaves you with F = F. In practice, however, it is commonly used to calculate an absolute value for global CO2 emissions from anthropogenic activities. It is also helpful in understanding how the four factors need to change relative to each other over time to reach a target level of CO2 emissions in future, and to understand how the four factors have changed in the past.

The expression simply states that emissions of greenhouse gases are the product of the population, GDP per person, energy efficiency, and emissions intensity.

KAYA Equation usages in Policy making:

The Kaya identity underlies the Intergovernmental Panel on Climate Change's (IPCC) analysis of emissions scenario literature. The analysis provided a basis for current assessments of greenhouse gas emissions and possible response strategies. In the context of policy-making, the Kaya identity is often expressed as:

Global CO2 emissions from human resources= Global population X Global GDP per capita X Energy Intensity X Carbon Intensity

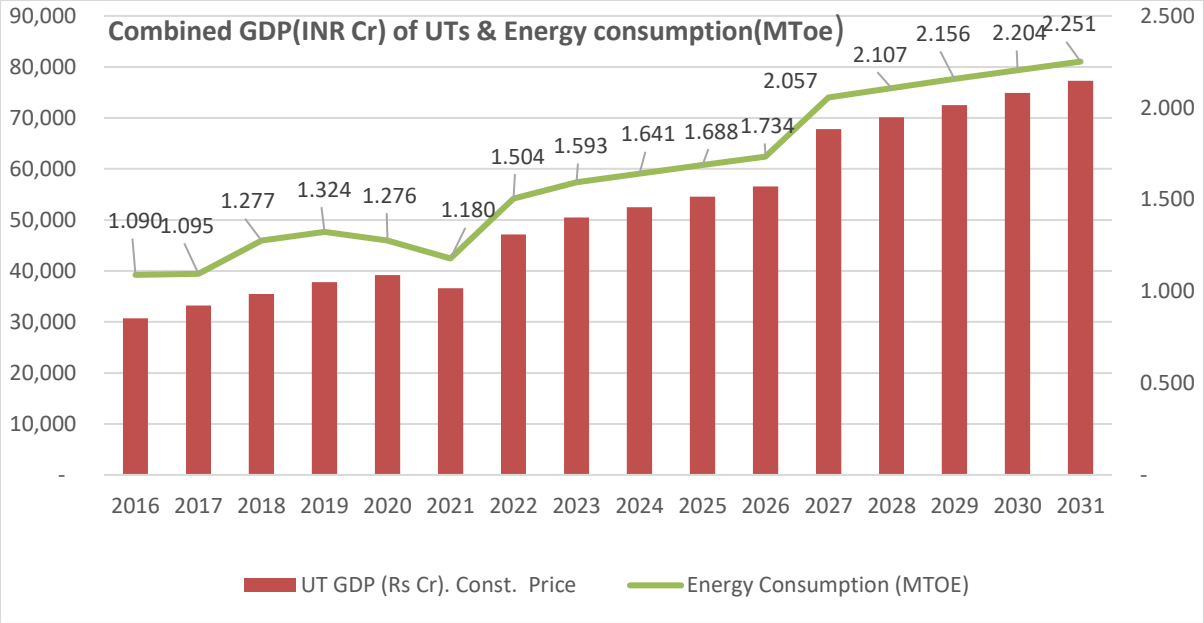
The expression simply states that emissions of greenhouse gases are the product of the population, GDP per person, energy efficiency, and emissions intensity.

Energy Intensity – varies by country and region with underlying factors such as economic structure, climate, geography and energy efficiency policies.

Carbon Intensity – is driven by the prevailing form of energy generation. Measured on a total life cycle basis, renewable energy sources have a lower Carbon Intensity than fossil fuels.

The methodology employed for estimating the TFEC projection for Karnataka involved analysing historical trends in final energy consumption and Gross State Domestic Product (GSDP) and growth of GSDP as per the state's vision.

As per the **National Council of Applied Economic and Research (NCAER),** Daman and Diu formed 0.12 per cent of Indian GDP during the period from 2008–09 to 2012–13 and Dadra and Nagar Haveli formed 0.15 per cent of Indian GDP during the period 2008–09 to 2012–13[19]. The combined GDP of the UT contributed 0.27 per cent of Indian GDP during the period 2008–09 to 2012–13.



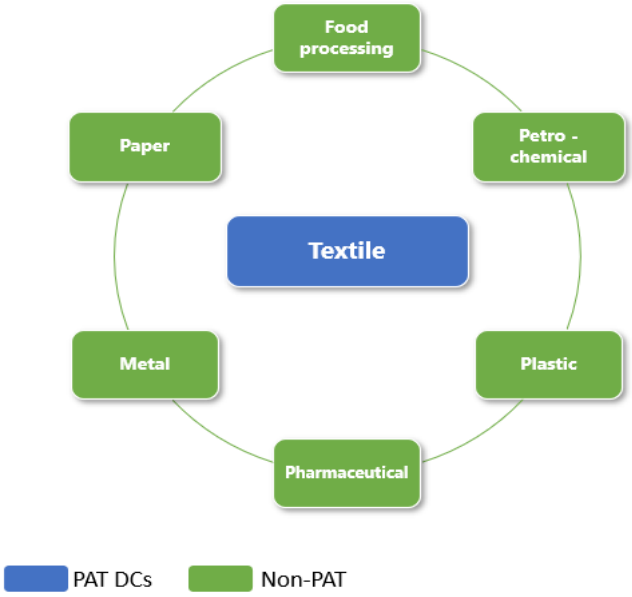
It is assumed that UT (DNH&DD) contribution in overall Indian economy will be 0.32% from FY 2022-2026 and 0.37% from FY 27 to FY 31. According to this assumption the combined GDP of UT (DNH&DD) is expected to reach 77,247 INR Cr. at constant prices by 2031. Based on the actual energy consumption till FY 20 and projected GDP, it is forecasted that energy consumption of UT will reach 2.251 MTOE by 2031.

[19] https://www.ncaer.org/project/gross-state-product-of-dadra-nagar-haveli

4 FOCUS SECTOR 1: INDUSTRY

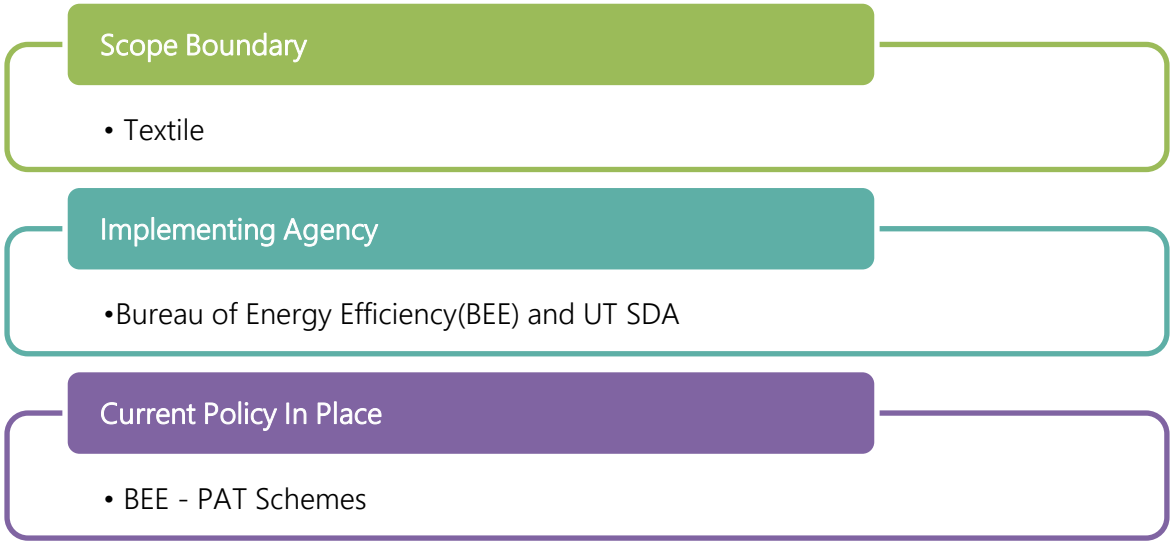
The UT has aim to promote vibrant industrial growth and overall economic development to promote sustainable and inclusive industrial growth. In order to meet its objective UT Administration has identified priority sectors and thrust areas for investment. The following are the thrust area;

- Textile sector (Excluding Dying)
- Electronic and electrical industry
- IT & ITeS industry
- Light Engineering and allied industry
- Plastic, paper, printing and packaging
- Automobile and ancillary sector
- Marble and tile industry
- Garment and apparel industry
- Agro and food processing industry
- Marine product-based industry



4.1 Strategy: PAT Deepening opportunity in Textile sector

In UT, only two textile industries are designated consumer under BEE-PAT scheme and other are Non-PAT sectors.



To become DC in textile sector, DC should have total energy consumption of 3000 TOE. Details of two DCs in textile sector is as given below.

Table 16 Textile companies as DCs under PAT cycle

Name of Industry in PAT Cycle	PAT Cycle-6	Specific energy consumption (TOE/Ton of equivalent product)	Production (Ton)	Specific energy consumption (TOE/Ton of equivalent product) 2022-23	Energy Consumption TOE	Energy Consumption MTOE
Sanathan Textiles Private Limited,	TXT0163DN	0.094	2,17,740	0.089	20,489	0.020
Alok Industries Limited,	TXT0164DN	0.662	28,375	0.623	18,796	0.019
Total Energy			2,46,115		39,285	0.039

As per above table total energy consumption of two industries are above 3000 TOE. In PAT cycle-8, BEE has included 8 more companies listed below;

Sr. No.	Company in DNHDD	Registration No	Specific energy consumption (TOE/Tonne of equivalent product)	Equivalent Major Product Output (Tonne)	Specific energy consumption on (TOE/Tonne of equivalent product)
1	Jiwarajka Textile Industries, Kanadi Fatak, Naroli, Silvassa, Dadra & Nagar Haveli,396235	TXT0195DN	0.0559	65646	0.0536
2	DNH Spinners Pvt Ltd, Surangi, Silvassa, Dadra and Nagar Haveli, 400054	TXT0196DN	0.0583	184510	0.0558
3	Beekaylon Synthetics Pvt Ltd., Plot No.207, 205/1, 205/2, Masat, Silvasaa, Dadra & Nagar Haveli,400021	TXT0197DN	0.0762	87781	0.0719
4	JBF Industries Limited, Plot No.156/2, Saily Rakholi Road, Village Saily, Silvassa-396230, UT of Dadra & Nagar Haveli	TXT0198DN	0.0815	134476	0.0765

Sr. No.	Company in DNHDD	Registration No	Specific energy consumption (TOE/Tonne of equivalent product)	Equivalent Major Product Output (Tonne)	Specific energy consumption on (TOE/Tonne of equivalent product)
5	Shubhlakshmi Polyesters Limited,Survey No.179/1/2 & 179/1/4,Silvassa,Dadra Nagar haveli,396230	TXT0199DN	0.0899	63444	0.0838
6	UNIFY TEXTURISERS PVT LTD, Village- Karad,P-O Silvassa, Dadra & Nagar Haveli,396230	TXT0202DN	0.1789	72376	0.1683
7	Bhilosa Industries Pvt Ltd., Plot No. 37 & 46/1/1/1, Village Rakholi, Sayli Road, Silvassa Dadra and Nagar Haveli (UT), 396230	TXT0204DN	0.2424	212913	0.228
8	Bhilosa Industries Pvt Ltd., Plot No. 199, Village Naroli , Silvassa, Dadra And Nagar Haveli, 396230	TXT0205DN	0.2268	451325	0.2133

Now there are total 10 companies in textile sector under PAT scheme of BEE. In future UT may look for inclusion of more companies under PAT scheme based on energy intensity of the companies.

There are many more industries in textile sector which has electrical energy alone in the range of 1000 TOE to 2300 TOE. If threshold limit of textile sector is decreased further there are chances of including more textile industries in PAT cycle. List of textile companies in the UT having electrical energy consumption above 1000 TOE is listed below;

Table 17 List of textile companies in the UT having electrical energy consumption more than 1000 TOE

Sr. No.	Name Of Consumer in DNH	Contract Demand	Monthly - KWH CONSUMPTION	Monthly - KVAH CONSUMPTION	Average Annual Consumption (kWh)	Approximate Toe Consumption (Electrical)	Energy consumption (MTOE)	Energy consumption (TOE)
1	M/S MEHRA POLYTEX PVT LTD, SURVEY NO.171	4000	2145250	2170000	25743000	2213	0.002	2,214
2	M/S VASUPUJYA FILAMENTS	3850	2030550	2067700	24366600	2095	0.002	2,096
3	M/S MADURA INDUSTRIAL TEXTILES,	2950	1524210	1532670	18290520	1573	0.002	1,573
4	M/S. AUDAX PROTECTIVE FABRICS PVT. LTD;	4000	1504750	1508750	18057000	1553	0.002	1,553
5	M/S BHUMI YARNS PVT LTD.,	2650	1396080	1399920	16752960	1440	0.001	1,441
6	M/S. DODHIA SYNTHETICS LIMITED	3500	1295540	1295960	15546480	1337	0.001	1,337
7	M/S. MICROFIBER CORP PRIVATE LIMITED;	4500	1252300	1261600	15027600	1292	0.001	1,292
8	M/S MADHUSUDAN RAYONS PVT LTD.,	2500	1205595	1212075	14467140	1244	0.001	1,244

Sr. No.	Name Of Consumer in DNH	Contract Demand	Monthly - KWH CONSUMPTION	Monthly - KVAH CONSUMPTION	Average Annual Consumption (kWh)	Approximate Toe Consumption (Electrical)	Energy consumption (MTOE)	Energy consumption (TOE)
9	M/S PATODIA FILAMENTS PVT LTD(UNIT-II)	1800	1149840	1154960	13798080	1186	0.001	1,187
10	M/S VALSON POLYESTER PVT. LTD.,	2200	1118250	1134510	13419000	1154	0.001	1,154

Textile industry including Yarn, Spinning and Apparel from a crucial part of the Indian economy. UT is the leader in integrated textile plants and polyester hub and contribute 80% of India's Yarn production and below table shows overall Yarn production for UT.

Table 18 Overall Yarn Non-PAT Production for DNH&DU

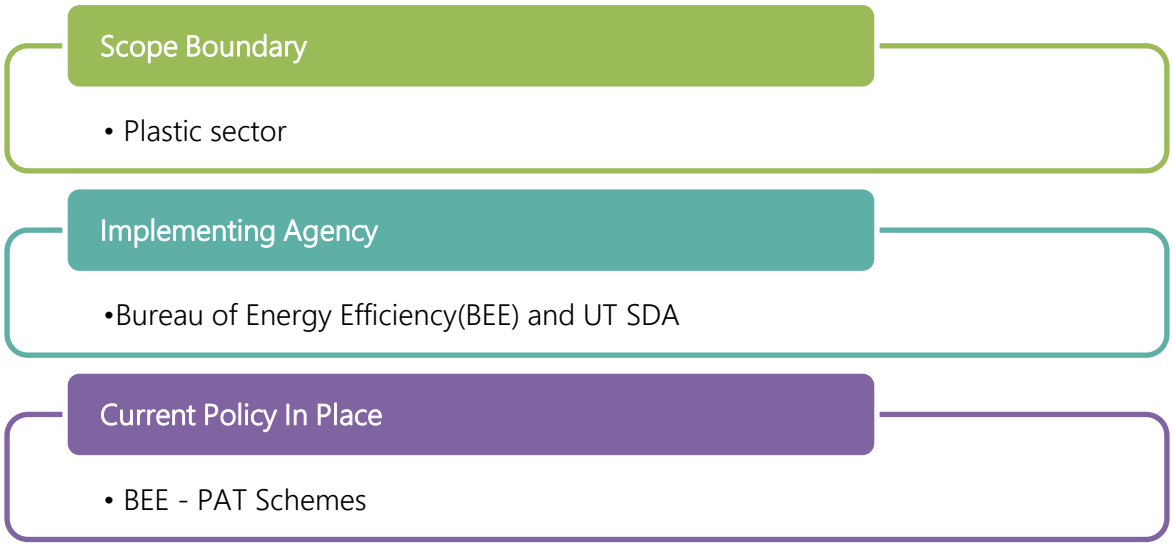
Particular	Unit	Value
Yarn Production in India-2020	Million Kgs	4762
Yarn production in UT	%	80%
Yarn production in UT	Million Kgs	3809.6
Ring yarn production-SEC	kWh/Kg	3.57
Energy Consumption	Lakh kWh	170003.4
Growth rate of yarn sector	%	5%
Production of yarn by 2025-26	Million TPA	5.0
Production of yarn by 2030-31	Million TPA	6.2

The energy saving potential of the UT is estimated as .04 MTOE by FY 31 which will reduce CO2 emission of approx. 0.119 MTOE by 2031 under textile sector

Table 19 Energy Saving Potential in UT's MSME Textile Sector

Particular	Unit	FY 2030-31	
		Moderate	**Ambitious**
Energy Saving	MTOE	0.02	0.04
CO2 emission avoidance	MTCO2	0.071	0.119

4.2 Strategy: PAT Widening opportunity in Plastic sector



DNH&DU is also a leader in plasticizers and contributing 28% share of India's plastic production. Total India's plastic production in 2021 was 1.5 MTPA. Considering UT contribution of 28%, UT's total production is estimated as 0.42 MTPA as shown in below table;

Table 20 Plastic Production scenario for DNH&DU

Particular	Unit	Value
India Plastic production 2021	Mn MTPA	1.5
% Contribution of UT	%	28%
Production of Dadra and Daman	Mn MTPA	0.42
Average energy consumption	kWh/Kg	2.811
Energy consumption in Plastic Industry-DNHDD	Mn kWh	1180.62
Energy consumption in Plastic Industry-DNHDD	MTOE	0.1015
Production in DNHDD by 2025-26	Mn MTPA	0.4964
Production in DNHDD by 2030-31	Mn MTPA	0.5868
Energy consumption in DNHDD by 2025-26	MTOE	0.1200
Energy Consumption in DNHDD by 2030-31	MTOE	0.1418

Plastics is not currently under the PAT, so with right feasibility studies and benchmarking of plastic industries in the UT, plastic can be included in PAT. Below table shows the potential energy saving in moderate and ambitious scenario for the year 2030-31 in plastic sector.

Table 21 Energy Saving Potential in UT's MSME Plastic Sector

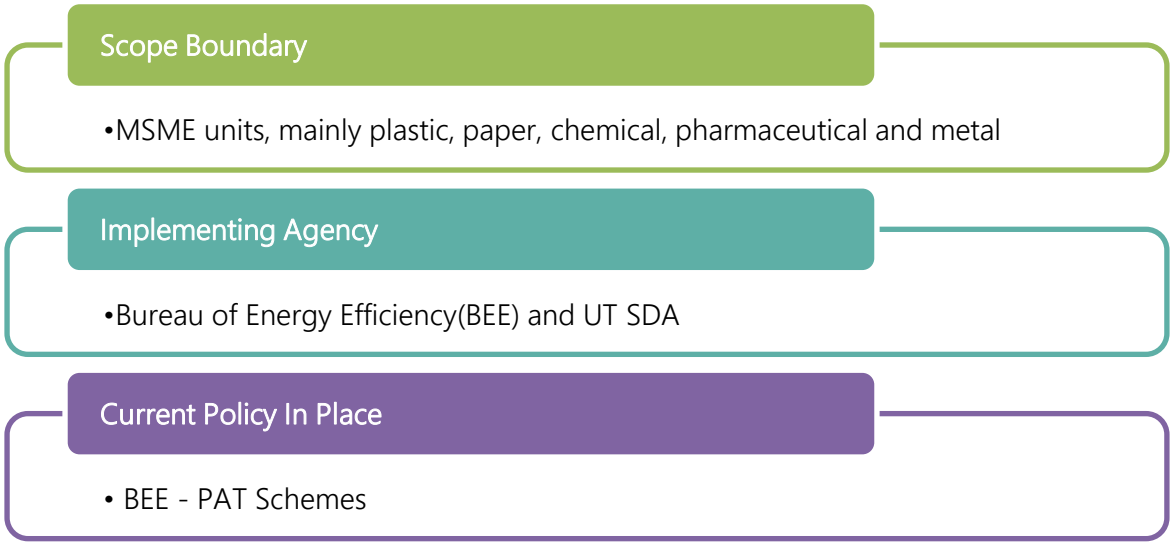
Particular	Unit	2030-31	
		Moderate	**Ambitious**
Energy Saving	MTOE	0.009	0.011
CO2 emission avoidance	MTCO2	0.027	0.036

4.3 Strategy: Energy Efficiency Drive in MSME

The share of industry sector in the GDP of UT of DNH&DD is approx. 32.78%. There are 39 Industrial Estates in Daman, 3292 Industrial Units of which 2929 are in the small-scale sector. Two industrial areas have been developed by Omnibus Industrial Development Corporation (OIDC) at Daman and other industrial areas are located at Dabhel, Bhimpore, Kachigam and Kadaiya[20].

The key sectors which have a large presence include polyester and cotton yarn (it is estimated that 80% of India's polyester yarn is made in these two UTs), plasticizers, papers, petroleum by products such as lube oils, pharmaceuticals, plastics, electrical conductors, marble Tiles.

In the textile sector, the industrial units are engaged in spinning (mainly cotton and micro yarn spinning) and processing (mainly texturising, twisting, weaving and knitting activities). While the main activity of the plastics sector is injection and blow moulded articles, includes industrial as well domestic household products, furniture, etc. The paper industry is engaged in the manufacturing of corrugated paper boxes, sheets, rolls, paper tubes, etc.



Decarbonizing MSMEs through promotion of energy audits

Particular	Unit	2031	
		Moderate	Ambitious
Energy Consumption (in MSMEs) (Projected)	MTOE	1.155	1.155
%age penetration in Industries	%	50%	60%
% energy efficiency scenarios	%	5%	8%
Energy Saving	MTOE	0.0432	0.0830
CO2 emission factor	Mn TCO2/MTOE	3.13	3.13
CO2 emission avoidance	Mn TCO2	0.1353	0.2599

Energy Saving Potential

Energy saving potential is estimated by calculating penetration of energy auditing practices in industries in moderate and ambitious scenarios that can be achieved through EE drives in MSMEs of UT that are not included under deepening and widening of PAT.

[20] https://utlbcdnhdd.com/ut-profile/industries/

Particulars	Moderate Scenario for 2030-31	Ambitious Scenario for 2030-31
Energy Saving Potential (MTOE)	0.043	0.083
GHG Emission Reduction Potential ($MtCO_2$)	0.135	0.260

Action Plans

This section describes several action plans that can be implemented across the industry sector for this strategy. For each of the strategies, a short, and long-term period has been taken into consideration for actionable instruments.

S. No.	Action Plans	Timeline
1	Sector-specific policy development for financial assistance on benchmarking the MSMEs within the clusters	Short Term
2	Subsidies for conducting energy audits and implementation of energy efficiency projects	Short Term
3	Promotion of Green Rating for Companies	Long Term
4	Implementation of scheme for energy saving such as Perform Achieve and Earn (PAE) specific to MSME Industry. PAE is future scheme of BEE	Long Term

Case Study: PAE guidelines by BEE[21]

Perform Achieve Earn (PAE) scheme is the new scheme that BEE is envisaging to unlock PAT like schemes for MSME which will help in improving SEC of energy-intensive industries and help in cost saving making industries more competitive. In the long-term BEE may also explore synergizing the emission Savings / Reduction by MSMEs to Evolving National Carbon market.

The key features of the scheme include,

Particulars	Key features of scheme
Participation	Voluntary for MSMEs
Compliance	No Penalization, MSMEs will earn ESCerts on overachievement of targets
ESCerts	Government will buy from MSME at levelized price of fuel
Fund	BEE will form the corpus to support the programme and ensure the purchase of ESCerts
Benefits	MSME generally use conventional technologies that offer several opportunities for improving efficiencies. Thus, lower investment can yield higher savings. Energy saving will help MSME to become more competitive and healthier work environment

[21] BEE, Ministry of Power

Key benefits to MSME:

1. Ample hand-holding support during scheme implementation including guidance for identifying and implementing efficient technology and measure, collecting, analysing and reporting of energy statistics
2. A mechanism for monetizing of ESCerts earned by MSMEs will be put in place, thus offering an additional financial incentive over and above the energy savings achieved
3. This activity will generate a huge quantity of first-hand, measured and verified, industrial energy consumption data. Promote the culture of EMS, ISO50001 resulting in improved efficiency, productivity and profits for MSMEs

Case Study: Green rating of companies

No	Parameter	Points	%age Contribution of each points
1	Energy Efficiency	150	15%
2	Water Conservation	100	10%
3	Renewable Energy	100	10%
4	GHG Emission Reduction	100	10%
5	Waste Management	100	10%
6	Material conservation, Recycling & Recyclability	100	10%
7	Green Supply Chain	100	10%
8	Product Stewardship & Life cycle aspects	125	13%
9	Innovation for Environment	50	5%
10	Green infrastructure & Ecology	75	8%
	Total points	1000	100%

List of Green rated companies in Daman

Company	Sector	Location	State	Rating Level
Hindustan Petroleum Corporation Limited - Lube Plant	Petrochemical	Silvassa	Daman	Silver
Hindustan Petroleum Corporation Limited - Lube Plant	Petrochemical	Silvassa	Daman	Platinum

Indian Oil Corporation Ltd - Lube Plant	Petroleum Marketing	Silvassa	Daman	Silver

4.1 Energy saving summary: Industry Sector

Action	Energy Savings in 2031 under moderate scenario (Mtoe)		Emission Savings potential by 2031 in moderate scenario (MtCO2)	
	Moderate	Ambitious	Moderate	Ambitious
PAT Deepening (Textile Sector)	0.02	0.04	0.071	0.119
PAT widening	0.009	0.011	0.027	0.036
Energy Efficiency Drive in MSMEs	0.043	0.083	0.135	0.26
Total	0.072	0.134	0.233	0.415

4.2 Monitoring Mechanisms

Following are the possible monitoring mechanisms for strategies in industry sector.

Table 22 Monitoring Mechanism: Industry sector

Policy/Scheme/Action plan	Monitoring Mechanism
Monitoring of energy data	The UT SDA can monitor industry compliance with energy policies through data collection and analysis, as well as through partnerships with industry associations and other stakeholders.
Audits	Energy audits can be conducted by independent third-party providers to assess the energy consumption and efficiency of industrial facilities. These audits can help identify areas for improvement and track progress towards energy policy goals.
Reporting	Mandatory reporting requirements or through voluntary reporting programs that incentivize companies to disclose their energy use and emissions data.
Industry associations	Industry associations can play a key role in monitoring energy policies for their members.

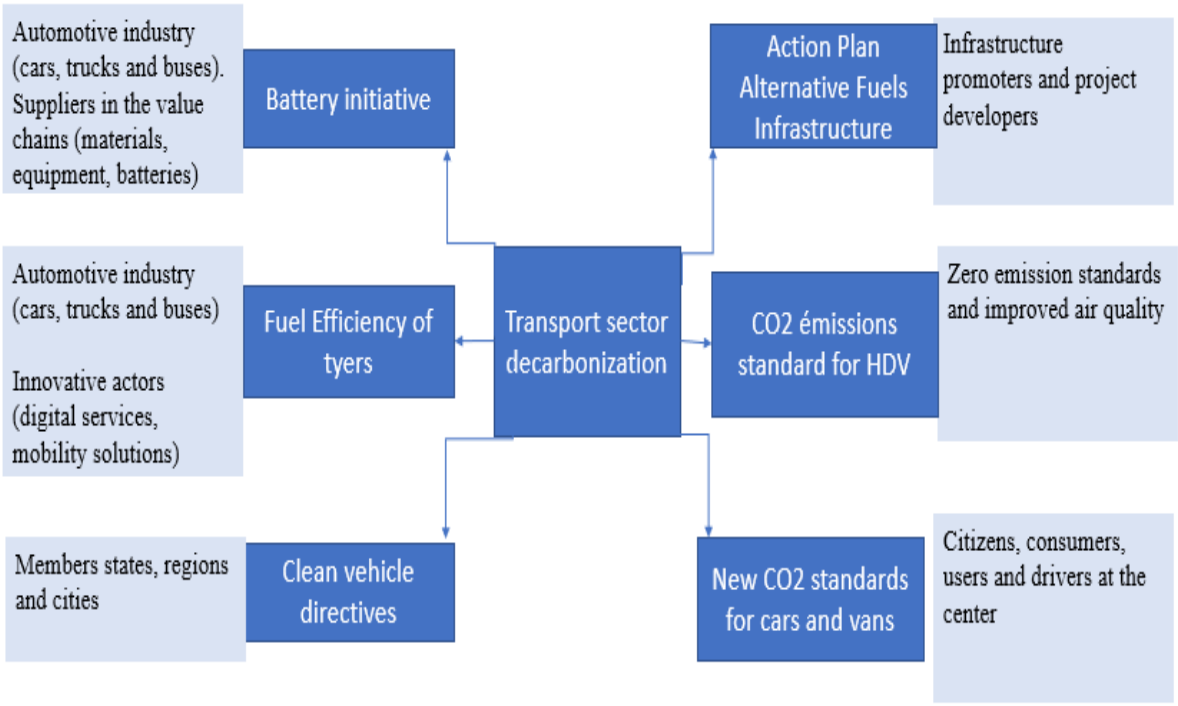
5 FOCUS SECTOR 2: TRANSPORT

In the transport sector, there is a need to include and promote energy efficient public transport besides policy level intervention for efficient or clean fuel vehicles. Several states/UTs have come forward with a state/UT level incentivisation for Electric Vehicles. Policy and framework for electric vehicles at the state/UT level needs further focus. Though energy efficiency is a multi-dimensional subject, defining key focus areas to bridge gaps is the need of the hour. While some states/UT may have the potential to improve efficiency in a particular sector, there may be gaps in terms of identification of these sectors.

The need to decarbonize our societies is critical in view of climate change. The transportation sector, and specifically the road transport sector within it, is unique. It's difficult because transportation demand is rising, leading to increase the uses of petrol and diesel finally adding greenhouse gases to atmosphere.

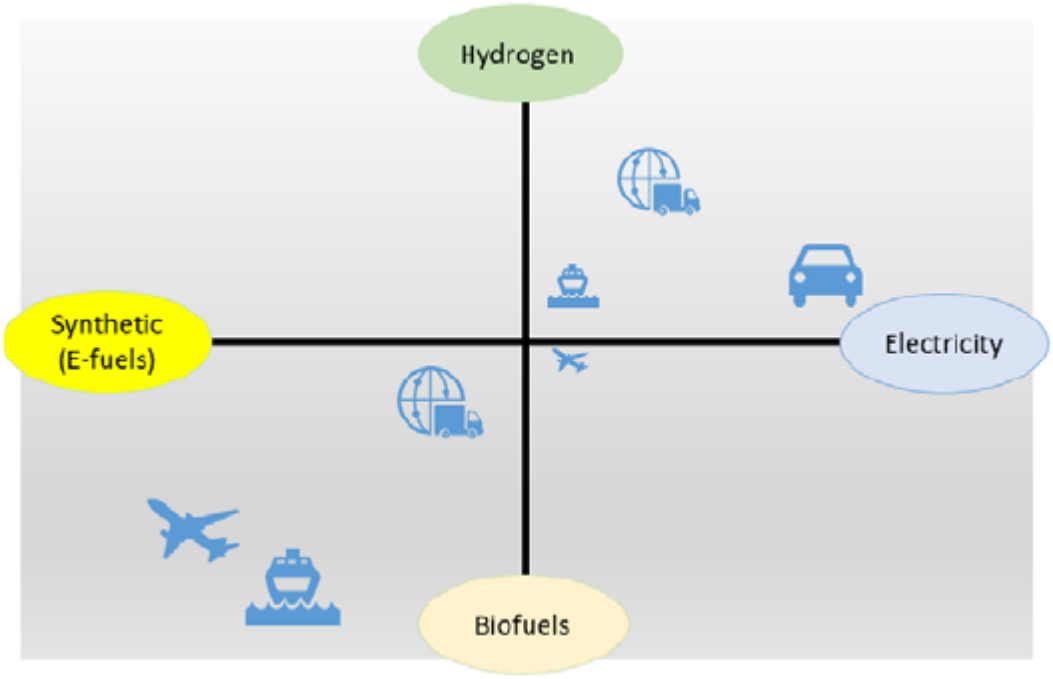
There are many solutions for sustainable transport system such as use of biofuels, e-fuels, and other low carbon fuels. However, none of them will be able to address this massive problem on their own, and renewable transportation fuels play a critical role in closing the carbon emissions gap.

Over the next 30 years, the transportation sector will have to undergo structural changes to achieve significant emission reductions. To fully engage in the transformation of the transportation sector, market actors need strong policy signals to support the market uptake of zero-emission vehicles, increased production and use of sustainable fuels, and a significant rollout of infrastructure for recharging batteries and refuelling with alternative fuels. Below figure shows the integrated approach in transport sector for unlocking the potential of initiatives in the field of decarbonizing the transport sector.



By 2050, a variety of technology approaches and fuels might result in a 90% reduction in transportation-related emissions. While predicting the technology and fuel mix that will prevail in the transportation sector in the long run is speculative and uncertain, one thing is certain: meeting this ambitious goal in a cost-effective manner cannot be achieved through a single fuel or technology, but rather through an effective mix of policies and technologies tailored to the specificities of different transportation markets. Different decarbonization strategies must be tailored to specific modes of transportation, travel habits, supply chains, and logistics. Transportation decarbonisation also entails the adoption of sustainable mobility solutions such as

the promotion of public transportation, soft transport modes (cycling, e-scooters), changes in mobility behaviours/trip patterns (e.g. more teleworking), and modal shifts to less energy-intensive modes of transportation.



India has vowed to cut carbon emission intensity of GDP by 33 percent to 35 percent below 2005 levels by 2030 as part of its Nationally Determined Contributions (NDCs) and revised the goal of reducing emission intensity to 45% by 2030[22]. The NDCs demonstrate a distinct preference for mass transport systems such as buses and metros over private/low occupancy modes. It also recognises the need to move away from the road sector and toward more energy-efficient forms of transportation like rail and water. The goal of a 45 percent rail share in land transport is a huge step in the right direction. Electric vehicles, fuel efficiency improvements, and biofuel mixing are all cited as ways to improve the road sector transportation.

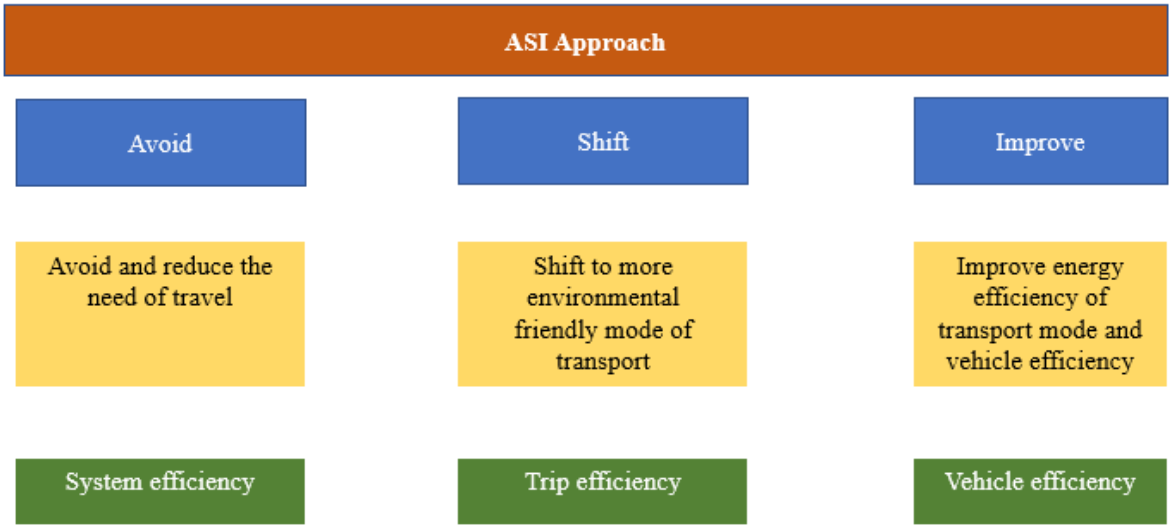
- **Approach for Transport sector efficiency**

The benefits of applying the ASI (Avoid, Shift and Improve) strategy to develop a sustainable transportation system are illustrated in the below figure.

According to the NITI Aayog report, traffic congestion costs a lot of money in terms of lost productivity and wasted fuel. According to the survey, the cost of congestion in our top four metros is over USD 22 billion per year. By finding alternatives that result in lower energy costs and less imported fuel, the ASI strategy will improve energy security. It will have an impact on the country's economic development by increasing private investment and reducing congestion, which will save time, which is a valuable commodity in today's world.

22

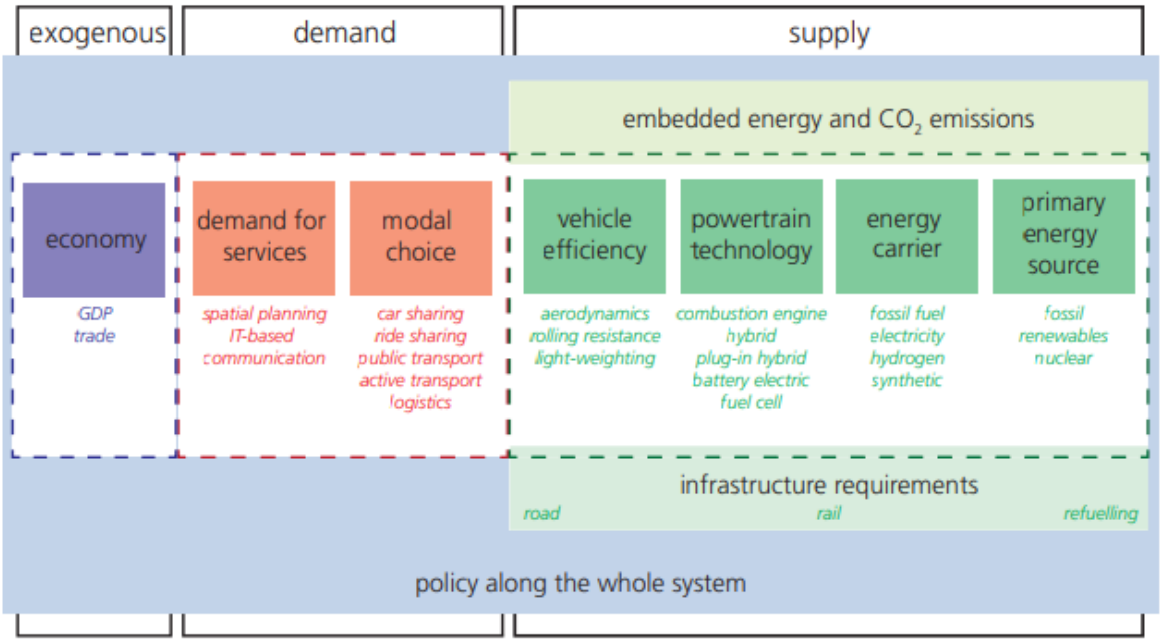
https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1847812#:~:text=As%20per%20the%20updated%20NDC,based%20energy%20resources%20by%202030.



- **Policy framework for decarbonizing and energy efficiency in the transport sector:**

To reduce the gap between the India's climate goals and actual CO2 emissions, a mix of technology and policy alternatives will be required. As new and improved technology are introduced to the market, as well as the demands for passenger and freight transportation, this balance is projected to change.

Below Figure depicts the portfolio of drivers and intervention options for the transition to a decarbonized future transportation system.



Transport Demand

- Encourage people to change their behaviour (e.g., by facilitating walking, cycling, teleworking, teleconferencing, web-streaming of events, more healthier lives, etc.) to reduce demand for passenger transportation services.
- Shift to modes of transportation that require fewer vehicle kilometres (kms) (e.g., shifting people and freight to vehicles with better specific load carrying capacity or boosting load factors of existing vehicles through sharing or pooling)

Transport Supply

- Enhance vehicle design (e.g., better aerodynamics, light-weighting to minimize vehicle energy demand, lower new vehicle fossil carbon footprint, etc.);
- Improve/deploy more efficient conventional powertrains as a transitional option, and maximise the potential of hybrid cars (hybridisation);
- Improve/deploy vehicles using alternative energy carriers (e.g. low-carbon electricity, hydrogen, and synthetic fuels) that are powered by primary energy sources as long-term sustainable solutions.

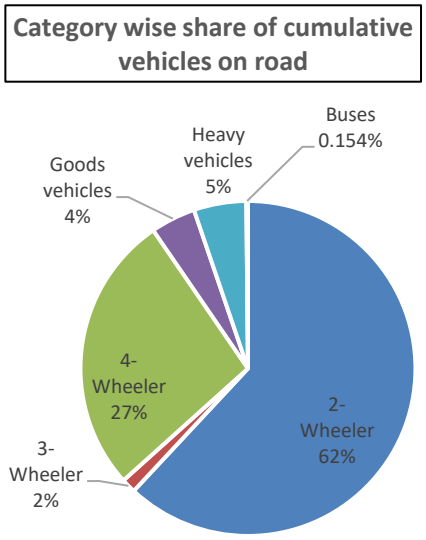
Fuel efficiency:

Emission standards have long been enforced in India. In 1991/92, the first set of standards for gasoline and diesel automobiles were implemented. The National Auto Fuel Policy outlined a timeline for implementing Bharat Stage emission requirements. These standards are focused on reducing air pollution, which necessitates overall improvements in vehicle performance.

In terms of fuel efficiency, the Corporate Average Fuel Economy (CAFÉ) standards, which were implemented in 2017, have yielded positive improvements for passenger cars. The weighted average CO2 emission from a manufacturer's production line must be less than 130 gm/km until 2022, and less than 113 gm/km thereafter, according to these regulations. Fuel efficiency policy is also implemented in EU which have resulted in improved fuel efficiency in transport sector.

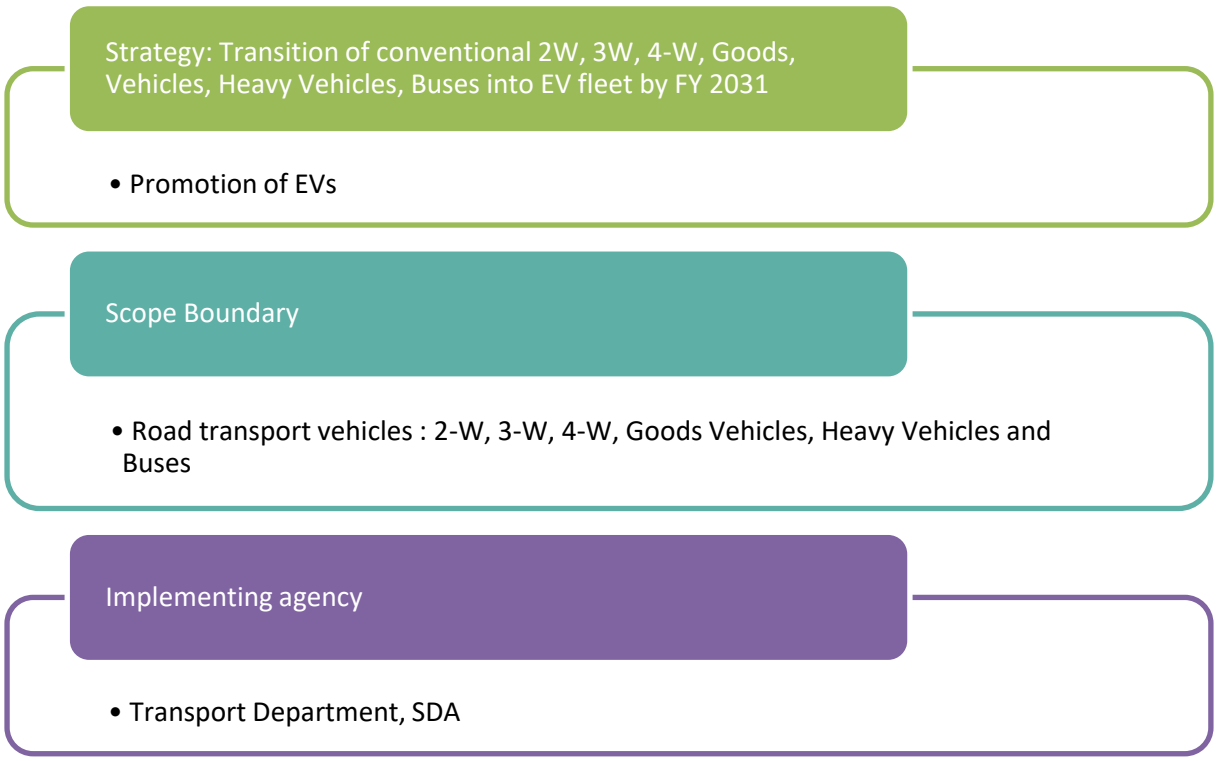
The UT has about 2.8 lakh registered vehicles as of June 2023. The 2 wheelers constitute 62% of the vehicles while remaining vehicles are 27% of 4 wheelers, 5% of Heavy vehicles, 4% of Goods vehicles, 2% of 3 wheelers and 0.15% of buses. Among the total vehicle stock, 298 vehicles are electric vehicles.

Cumulative no. of Vehicles in UT Till Today (As on 08 June 2023)			
Vehicle Category	**Petrol**	**Diesel**	**Electric**
2- Wheeler	2,25,084	154	174
3- Wheeler	3,009	2,018	57
4- Wheeler	57,376	41,139	38
Goods vehicles	238	15,564	3
Heavy vehicles	15	18,431	2
Buses	8	527	24
Total	**2,85,730**	**77,833**	**298**



5.1 Strategy: Transition of conventional 2W, 3W, 4W, Goods Vehicles, Heavy Vehicles, Buses into EV fleet by FY 2030-31

Electric vehicles are significantly more efficient than their petrol or diesel counterparts. While electric vehicles can convert around 60% of the electrical energy from the grid to power the wheels, petrol or diesel cars can only convert 17%-21% of the energy stored in the fuel to the wheels, resulting in a wastage of around 80%. Thus, electrification of road transport is a good way to reduce energy consumption and emissions, particularly as the grid becomes greener with increased use of renewables.



In DNH&DD out of the total registered vehicles, 0.08% are electric vehicles. There is a long way to go to make the transport sector transition from ICE vehicles to EVs. Creating awareness among the people and strengthening the charging infrastructure will increase the adoption of EVs in the UT.

By increasing the share of EVs in the vehicle stock of the UT with 36,291 EVs in ambitious scenario and 26,411 EVs in moderate scenario by 2030-31 will result into energy saving of 0.032 MTOE in moderate scenario and 0.037 MTOE in ambitious scenario by FY 2030-31.

The percentage of charging to be accomplished at public charging infrastructure for various vehicle categories is based on current research. Personal 2Ws and automobiles, for instance, may only need to use public charging for 10% of their charging needs and may be able to satisfy the majority of those demands at home or work.[23]

[23]https://www.niti.gov.in/sites/default/files/2021-08/HandbookforEVChargingInfrastructureImplementation081221.pdf

Charging Infrastructure	No. of charge points by 2031	
	Moderate	Ambitious
Public charging only	440	530
Dedicated/ Captive charging only	478	559
Battery Swapping only	279	387
Others (Including Home)	620	863

Energy Saving Potential

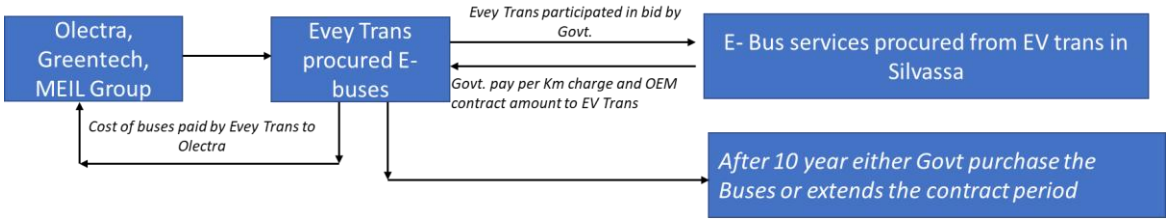
Particulars	Moderate Scenario for 2030-31	Ambitious Scenario for 2030-31
Energy Saving Potential (MTOE)	0.032	0.037
GHG Emission Reduction Potential (MtCO2)	0.101	0.116

Action Plans

This section describes several action plans that can be implemented across the transport sector for this strategy. For each of the strategies, a short-term and long-term period has been taken into consideration for actionable instruments.

Policy/Scheme	STRATEGIC AREA	Timeline
Awareness & Capacity Building	• Awareness on Energy Efficiency Program on High Energy Lithium-Ion Traction Battery Packs and Systems.	Short Term
	• Mandatory Purchase of EVs in Govt departments	Short Term
Technology Intervention	• Combined Charging Systems (CCS Standard)	Long Term
	• Charging stations based on open-access	Long Term
	• Pilot projects on Hydrogen Fuel Cell Vehicles	Long Term
	• Pilot projects on Battery Swapping stations for 2&3 wheelers	Long Term

Case Study: Silvassa e-Bus



Silvassa, a key industrial hub in India located between Maharashtra and Gujarat, India's two major economic powerhouses. At the same time, Silvassa was also included in the list of Indian "smart city" proposed by India Prime Minister Modi. The electrification of public transport, as part of the construction of the "smart city" of Silvassa, is a local government priority. The Olectra Greentech, a MEIL Group company has supplied EV buses under FAME-2 in Silvassa under Public Private Partnership Model.

5.2 Strategy: Promotion of Non-Motorized Transport (NMT)

Silvassa Smart City Ltd., in collaboration with ITDP India and UrbanMorph, unveiled a pan-city Cycle2Work campaign for businesses and organisations to promote cycling and foster a strong cycling culture in the city. The campaign urges workers to reevaluate all of their transportation options, abandoning their use of automobiles and motorcycles in favour of cycling to work in order to improve their health and protect the environment.

For the marketing test, Silvassa used a four-pronged strategy:

Onboard, Engage, Incentivize, and Monitor.

Onboard

The cycle2work journeys needed to be tracked on a single platform in order to measure the change in user behaviour and the uptake of cycling in the city. Through a leaderboard, UrbanMorph's revolutionary open-source platform Cycle to work makes cycling for commuting fun. People can see how they compare against others in their organisation, as well as in their city, country, and even the entire world, here! The platform currently has more than 450 registered organisations.

Cycleto.work shows:

- How many cyclists from a company have enrolled
- The leaderboard position of the company in comparison to other cycleto.work companies
- Fuel savings
- Carbon offset
- Routes that are used by the cyclists

Engage

"Cycling Ambassadors"—individuals who can promote cycling and can devote time to this initiative—were chosen for each of the industries. The Ambassadors urged their respective teams to register and log rides on the cycleto.work website. They inspired them by actively engaging with them through meetings, emails, and posters. On social media and corporate websites, they highlighted the experiences of those who rode to work, including those from senior leadership.

Incentivise

Industries also supplied infrastructure and incentives to maintain the momentum of cycling. The majority of industries have bike parking stations on their property. Since certain firms forbade the use of smartphones on the premises, some established locker facilities to safely store the employee devices. Showers and changing rooms were among the additional amenities that were being examined.

There were primarily three types of incentives:

A. Milestone-based gifts: Some industries gave a helmet, water bottle, and headlight to each new register. A t-shirt for completing 200 kilometres, a thermos water bottle for reaching 400 kilometres, and a bag for completing 600 km were also given to the bikers as rewards.

B. Financial incentives: Some Ambassadors received symbolic payments to entice others to join the organisation. One industry also proposed providing a Rs. 500 stipends to employees who commuted by bicycle.

C. Awards and recognition: Businesses gave certificates of appreciation to workers who commuted by bicycle.

Monitor

Weekly leaderboard updates and a WhatsApp group with industry ambassadors is used to track progress on a regular basis.

As more workers adopted cycling as their regular form of transportation throughout the test phase, the six industries gradually rose the leaderboard rankings.

The result

From more than 50 industries of Silvassa, 4,331 riders have conducted 15,333 rides, conserved 12,754 litres of fuel, and reduced carbon emissions by 29,517 kg together[24].

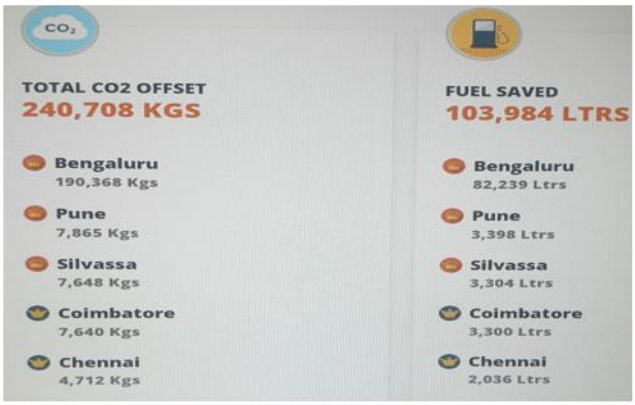


Table 23 Cycle 2 work leaderboard as on 8.11.2022

Sr. No.	Name of Company	08-11-2022			
		Rank	Cyclists	Rides	Distance
1	IPCA Laboratories Limited, Silvassa	4	466	2174	16113
2	Bhilosa Industries	9	205	757	5899
3	AYM Syntex	10	322	370	2512
4	TCPL Packaging Limited. Masat	11	186	636	3232
5	Sterlite Technologies, Silvassa	12	428	260	1346
6	Blue Star, Silvassa	14	213	213	889
7	Sterlite Power Transmission Ltd.	18	184	120	532
8	Parle Agro	20	49	391	1379
9	Vedanta Limited, Silvassa	22	62	254	4952
10	Reliance Industries Ltd. Silvassa	23	271	55	911
11	Hindustan Unilever Limited, Silvassa	27	56	167	483
12	Gulf Oil Lubricants	28	105	86	282
13	Apar Industries	31	158	50	407
14	Chemcoplastic Industries	36	103	56	348
15	President Engineering Works	44	27	118	439
16	Owens Corning Ltd	67	17	71	354
17	DNH Spinners	83	33	24	595
18	Hamilton Houseware	92	88	6	51
19	Dabur India	98	26	19	102
20	Sunpharma	112	29	13	50
21	Microfiber Corp. Silvassa	206	17	3	5
22	Emmbi Group	213	15	3	21
23	Aerofibre Pvt Ltd	224	18	2	4
24	Jai corp Ltd	229	15	2	4
25	Sanathan Textiles	269	10	1	35
26	Ramco Industries	516	8	0	0
27	JSK Industries,Silvassa	526	1	0	0

Energy Saving Potential

[24] Leaderboard | Organisations (altmo.app) – Accessed on 21 August 2023

By replicating the similar campaign in other cities of the UT, and increasing the participation to 15,000 and 20,000 riders in the UT by 2031 in moderate and ambitious scenarios, the UT can save 92 TOE and 123 TOE respectively by 2031.

Particulars	Moderate Scenario for 2030-31	Ambitious Scenario for 2030-31
Energy Saving Potential (TOE)	92	123
GHG Emission Reduction Potential (tCO2)	288	385

Action Plans

This section describes several action plans that can be implemented across the transport sector for this strategy. For each of the strategies, a short-term and long-term period has been taken into consideration for actionable instruments.

Sl. No.	Action Plans	Timeline
1	Promotion of NMT by ULBs by creating pathways for cycling	Short Term
2	Encourage offices to participate in the initiative by incentives	Short Term
3	Mandating offices for having special parking for cycles and shower rooms for cyclists	Long Term

5.3 Energy saving summary: Transport Sector

Action	Energy Savings in 2031 (Mtoe)		Emission Savings potential by 2031 (MtCO2)	
	Moderate	Ambitious	Moderate	Ambitious
Transition of conventional 2W, 3W, 4W, Goods Vehicles, Heavy Vehicles, Buses into EV fleet	0.032	0.037	0.101	0.116
Promotion of Non-Motorized Transport (NMT)	0.0001	0.0001	0.0003	0.0004
Total	0.032	0.037	0.101	0.116

5.4 Monitoring mechanism

Following are the monitoring mechanisms that could be implemented to track the progress and effectiveness of the policies in the transport sector in DNH&DD:

Policy Type/Scheme/Action Plan	Monitoring Mechanism
Data Collection	Regular data collection and analysis can help track progress towards these targets and indicators. The UT government can collect data on the number of electric vehicles on the road, the amount of fuel consumed, and the usage of public transportation. This data can be analysed to assess the effectiveness of policies and identify areas where improvements can be made.
Reporting	The UT government can publicly report on progress towards climate change targets and indicators. This can be done through annual reports or other public documents. By making this information public, the government can increase accountability and transparency, and encourage public engagement and participation.
Stakeholder engagement	Engaging with stakeholders, including industry, civil society, and the public, can help ensure that policies are effective, and that progress is being made. The UT government can establish stakeholder groups or committees to provide feedback on policies, identify potential challenges, and suggest improvements.
Technology Assessment	Regularly assessing emerging transport technologies and their potential impact on greenhouse gas emissions can help inform policy decisions and ensure that policies remain up to date with the latest developments.

6 FOCUS SECTOR 3: BUILDINGS

6.1 Strategy: Notification of Implementation of ECBC for commercial buildings and ENS for residential buildings

The buildings sector likely provides significant opportunity for reductions in energy consumption and GHG emissions. Currently, India's buildings account for around one-fifth of total CO_2 emissions and nearly 33 percent of the nation's energy use. The buildings sector is also one of the largest consumers of natural resources. In the absence of peremptory energy efficiency improvements and policy measures, the buildings sector is projected to emit seven times more CO_2 by 2050, as compared with 2005 levels. Meanwhile, the residential sector's overall energy use could increase eightfold.

In UT, the domestic and commercial sector is the third largest consumer of electricity and second largest consumer of total energy consumption. Effective use of energy efficiency strategies in this sector paves the way to reduce the future energy consumption of the state.

ECBC is not yet mandatory in the UT. To begin with, ECBC 2017 should be made mandatory for buildings or building complexes that have a connected load of 100 kW or greater, or a contract demand of 120 kVA or greater and are intended to be used for commercial purposes. Also ECO-Niwas Samhita should be implemented in residential sector.

The following strategies can be used to achieve the energy reduction of domestic and commercial sector.

Strategy: Notification of Implementation of ECBC and ENS

- ECBC is energy conservation building code for commercial buildings.
- Eco Niwas Samhita" is an energy conservation building code launched by the Bureau of Energy Efficiency (BEE) in 2018. The code provides guidelines for energy-efficient design and construction of residential buildings and is aimed at reducing energy consumption, promoting energy efficiency, and reducing greenhouse gas emissions from buildings.

Scope Boundary

- ECBC is applicable for commercial buidlings or building complexes that have connected load of 50kW or greater, or contract demand of 60 kVA or greater used for commercial purposes. The conncetd load of 50 KW and contract demand of 60 KVA is suggested by UT.
- ENS applies to "Residential buildings" with plot area ≥ 800m^2. The policy applies to new residential buildings, including single-family homes, multi-family buildings, and gated communities.
- The policy provides guidelines and specifications for energy-efficient building design, construction, and operation.
- The policy covers various aspects of building design and construction, such as orientation, insulation, lighting, ventilation, and renewable energy systems.

Implementing agency

- UT SDA, Town planning department

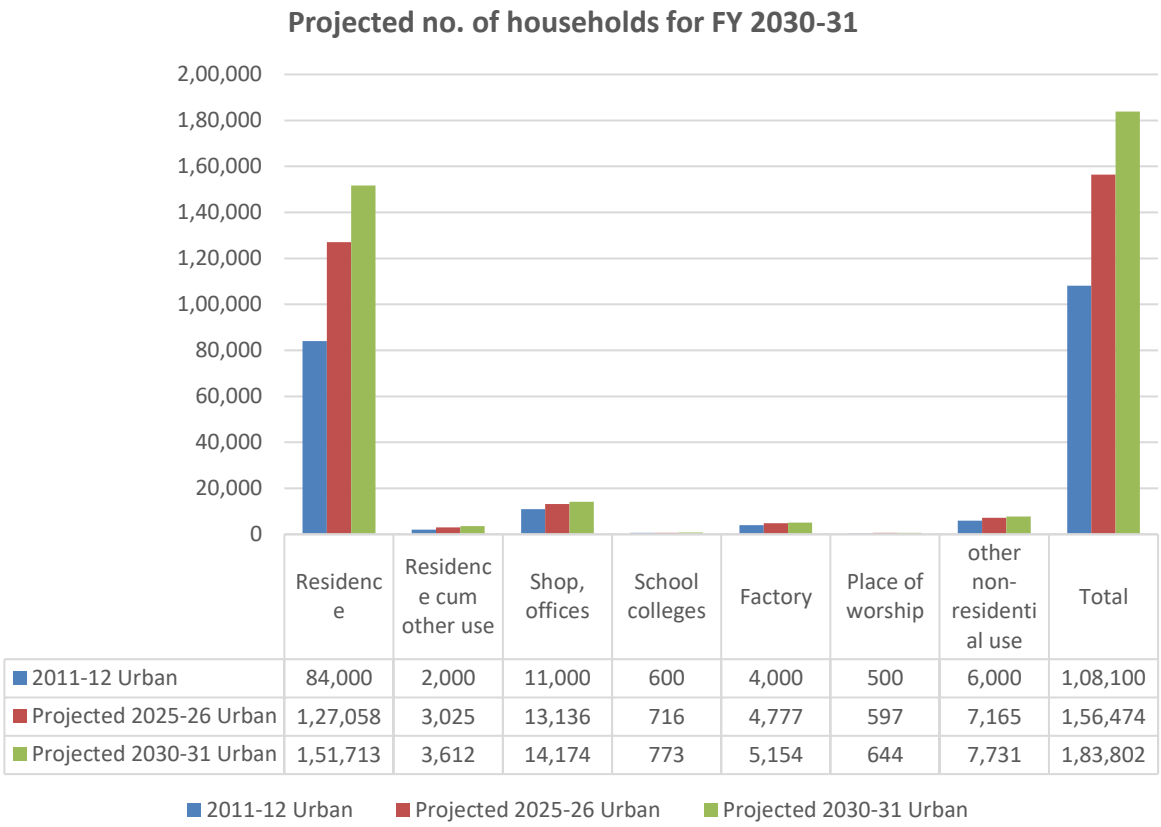
Current Policy In Place

- ECBC & ENS Guidelines by BEE

Energy Conservation Building Codes (ECBC) is program launched by BEE to promote energy efficiency in commercial buildings, Eco Niwas Samithi (ENS) is a program launched to promote energy efficiency in residential buildings. The importance of ECBC and ENS for energy efficiency lies in its potential to reduce energy consumption and greenhouse gas emissions, which is major contributor to climate change. By promoting energy-efficient practices in buildings, these programs can help reduce the demand for energy and promote the use of renewable energy sources. This, in turn, can help in achieving the country's goal of reducing its carbon footprint and mitigating the impact of climate change.

ECBC is in final stage of gazette publication and ENS is in draft stage in the UT.

Below figure shows the projected number of households for 2030-31.



	Residence	Residence cum other use	Shop, offices	School colleges	Factory	Place of worship	other non-residential use	Total
2011-12 Urban	84,000	2,000	11,000	600	4,000	500	6,000	1,08,100
Projected 2025-26 Urban	1,27,058	3,025	13,136	716	4,777	597	7,165	1,56,474
Projected 2030-31 Urban	1,51,713	3,612	14,174	773	5,154	644	7,731	1,83,802

Figure 13 Projected number of households for FY2030-31

Below table shows the energy saving by implementing of ECBC and ENS. The saving potential for FY2030-31 is MTOE in moderate and ambitious scenario which is estimated by calculating energy saving per building (kWh/house) which is then multiplied with the projected additional households till FY2030-31 for both moderate and ambitious scenarios. Similarly, the GHG saving potential for this strategy is 0.00019 & 0.00054 $MtCO_2$.

Table 24 Energy Saving by Implementation of ECBC and ENS

Particular	Unit	2030-31	
		Moderate	Ambitious
Energy saving Under ECBC and ENS	MTOE	0.00058	0.00137
CO2 Reduction	MtCO2	0.0018	0.0042

Action Plans

This section describes several action plans that can be implemented across the residential sector for this strategy. For each of the strategies, a short-term, and long-term period has been taken into consideration for actionable instruments.

S. No.	Action Plan	Implementation
1.	Market Outreach for ECBC/ ENS compliant products, radio jingles, social media awareness.	Short Term
2.	Home Energy Auditor Training	Short Term
3.	Compliance structure and rebates on energy savings for first few projects.	Short Term
4.	Development and maintenance of ECBC/ ENS compliance portal.	Short Term
5.	Pilot project investment for Super ECBC buildings as case studies.	Short Term
6.	Promote green building rating of buildings	Short Term

6.2 Strategy: Deepening of Standard & Labelling Programme

The Bureau of Energy Efficiency (BEE) in India has implemented a standard and labelling program to promote the use of energy-efficient appliances. Under this program, old and inefficient appliances are encouraged to be replaced with new ones that meet the minimum energy performance standards (MEPS) set by the BEE.,

The labels help consumers make informed choices, thereby reducing energy consumption and costs. In the context of domestic buildings, the S&L Programme can significantly reduce energy consumption by promoting the use of energy-efficient appliances, lighting, and building materials. This, in turn, will help in mitigating greenhouse gas emissions, reducing energy bills for consumers, and promoting sustainable development.

Scope Boundary

- The scope boundary of this strategy includes appliances like television, air conditoner, refrigerator, geyser, fans etc used in domestic buildings in urban as well as rural areas in the state.

Implementing Agency

- UT SDA, Town Planning Department

Current Policy In Place

- BEE S&L Rating Programme

Below table showing the estimated numbers of household appliances for 2025-26 and 2030-31. for rural area, fans have considered 1 per household and 3 for urban per household. AC, refrigerator, and washing machine are not considered for rural household.

Table 25 Estimated Numbers of Household Appliances for 2025-26 and 2030-31

YEAR			2025-26	2030-31
Household Items	**2025-26**		**2030-31**	
	Urban	**Rural**	**Urban**	**Rural**
Fan	129173	48961	2,03,140	59,826
AC	86,115		1,35,427	
Refrigerator	43,058		67,713	
TV	48961	43,058	67,713	59,826
Washing Machine	17,223		27,085	

Table 24 and 25 shows MTOE and MTCO2 potential saving for FY2025-26 and FY2030-31. Five household items (Fan, AC, Refrigerator, Washing Machine) considered under this strategy.

Table 26 Energy Saving Potential for FY2025-26

Household Items	**Total Numbers Considered**	**2025-26 Moderate** Scenario (**30% of total no.**)		**2025-26 Ambitious** Scenario (**50% of total no.**)	
		MTOE Saving	**MTCO2 Saving**	**MTOE Saving**	**MTCO2 Saving**
Fan	1,78,134	0.0006	0.0018	0.001	0.003
AC	86,115	0.0007	0.002	0.001	0.003
Refrigerator	43,058	0.0003	0.001	0.001	0.003
TV	92,019	0.00003	0.0001	0.00004	0.00012
Washing Machine	17,223	0.00002	0.00006	0.00003	0.00009
Total		0.0017	0.005	0.0028	0.0087

Table 27 Energy Saving Potential for FY2030-31

Household Items	**Total Numbers Considered**	**2030-31 Moderate** Scenario (**30% of total no.**)		**2030-31 Ambitious** Scenario (**50% of total no.**)	
		MTOE Saving	**MTCO2 Saving**	**MTOE Saving**	**MTCO2 Saving**
Fan	2,62,967	0.0009	0.0028	0.0015	0.005
AC	1,35,427	0.001	0.003	0.0018	0.006
Refrigerator	67,713	0.0005	0.0015	0.0008	0.002
TV	1,27,540	0.00004	0.00013	0.00006	0.0002
Washing Machine	27,085	0.00003	0.0001	0.00004	0.0001
Total		0.0025	0.008	0.0042	0.013

Energy Saving Potential

The energy saving potential is estimated by assuming 30% of appliances will be replaced with efficient appliances in moderate scenario and 50% appliances will be replaced under ambitious scenario.

Particulars	Moderate Scenario for 2030-31	Ambitious Scenario for 2030-31
Energy Saving Potential (MTOE)	0.0025	0.0042
GHG Emission Reduction Potential ($MtCO_2$)	0.008	0.013

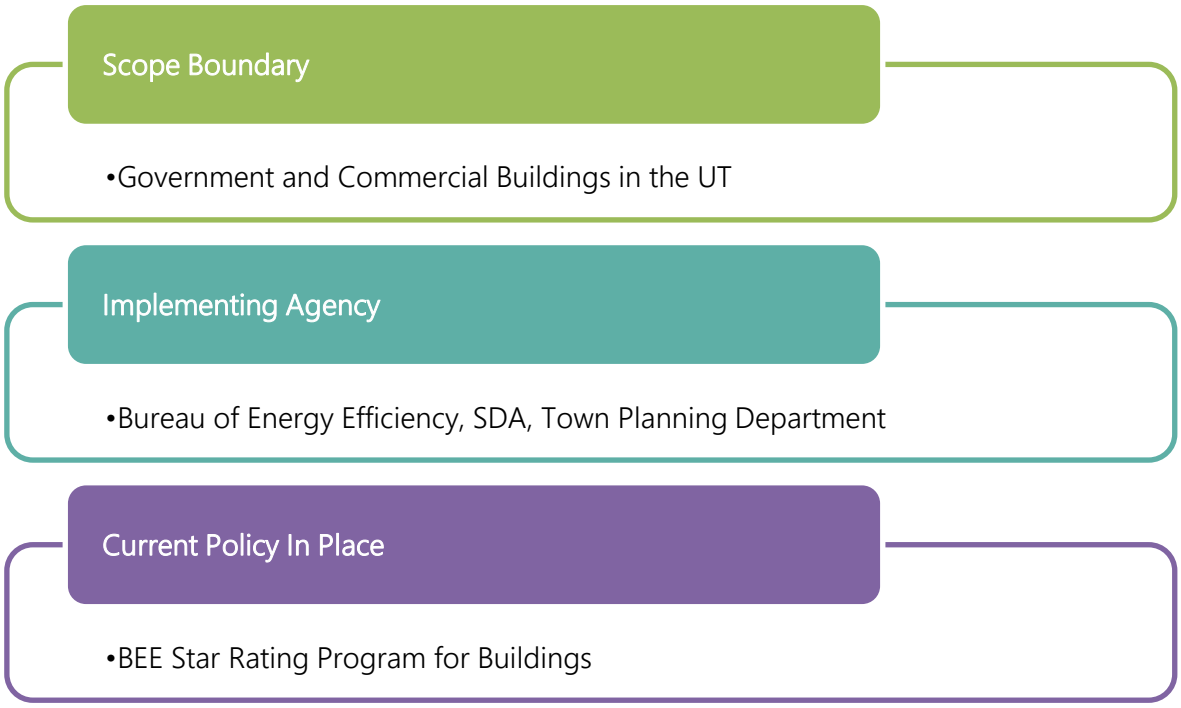
Action Plans

This section describes several action plans that can be implemented across the residential sector for this strategy. For each of the strategies, a short, and long-term period has been taken into consideration for actionable instruments.

Sl. No.	Action Plan	Timeline
1	DSM Schemes through DISCOM for energy efficient appliances such as BLDC fans, AC	Short Term
2	Retailers Training Programs in urban & sub-urban areas	Short Term
3	Mandatory purchase of minimum 4-star rated appliances by commercial buildings	Long Term

6.3 Strategy: BEE Star Rating of Buildings, Green buildings

Green buildings rating in India incorporates various features such as energy-efficient lighting, heating, ventilation, and air conditioning systems, and use renewable energy sources such as solar and wind power. This rating system also evaluates the other sustainability aspects like water conservation, loss of habitat, any harm to the environment during the construction etc. Green-rated Buildings comply with ECBC and are at least 20 - 30% more energy efficient than conventional buildings.



Energy Saving Potential

As per the housing census data, commercial buildings are further divided into offices, schools, hotels, lodges, factories, etc. The total number for each of the category in the state is projected to FY2026 and FY2031 and 1% penetration for star rating of buildings is assumed in moderate scenario and 2% for star rating of buildings in ambitious scenario for both FY2026 and FY2031

Table 28 Projection of commercial buildings by category - 2026 and 2031

No of Buildings Projections	Unit	2022 (Projected)	FY2026 (Projected)	FY2031 (Projected)
Shop, offices	Nos	12,646	13,136	14,174
School colleges	Nos	690	716	773
Factory	Nos	4,598	4,777	5,154

By considering star rating of the buildings as 1% of projected buildings, 0.0001 & 0.0005 MTOE energy saving potential can be achieved in moderate and ambitious scenario.

Table 29 Energy Saving Potential – Star rating of buildings and green rating of buildings

Particulars	Moderate Scenario for FY 2031	Ambitious Scenario for FY 2031
Energy Saving Potential (MTOE)	0.0001	0.0005
GHG Emission Reduction Potential ($MtCO_2$)	0.0004	0.0017

Action Plans

This section describes several action plans that can be implemented across the commercial sector for this strategy. For each of the strategies, a short and long-term period has been taken into consideration for actionable instruments.

Policy Type/Schemes	Action Plan	Timeline
Awareness & Capacity Building	1. Encouraging Green Education a. The inclusion of text modules on energy conservation for 6th to 10th classes into books in the school curriculum b. Create special branches in Engineering, and degree courses	Short Term
Subsidy	1. Incentives (Rebate in property Tax Additional FAR, reduction in stamp duty and faster environmental clearance for upcoming, green-rated building projects) 2. Transformation of government buildings to BEE star rated and green buildings 3. Incentive policy support to encourage star rated and green buildings	Long Term

6.4 Energy saving summary: Building Sector

Action	Energy Savings in 2031 (Mtoe)		Emission Savings potential by 2031 ($MtCO_2$)	
	Moderate	Ambitious	Moderate	Ambitious
Notification of Implementation of ECBC for commercial buildings and ENS for residential buildings	0.0006	0.0014	0.0018	0.0042
Deepening of Standard & Labelling Programme	0.003	0.004	0.008	0.013
BEE Star Rating of Buildings, Green buildings	0.0001	0.0005	0.0004	0.0017
Total	0.0037	0.0059	0.0102	0.0189

6.5 Monitoring mechanism

Following are the monitoring mechanisms that could be implemented to track the progress and effectiveness of the policies in the transport sector in DNH&DD:

Policy Type/Schemes	Monitoring Mechanism
Reporting & Disclosure	Establishing a system for enforcing compliance with energy efficiency codes and standards under operating conditions every few years can help ensure

	that buildings are meeting the required standards for reducing carbon emissions.
Performance contracting	The government can encourage performance contracting, where third-party contractors are responsible for implementing energy efficiency measures in buildings. The contractors can be required to report on energy savings achieved and the government can monitor these savings.

7 FOCUS SECTOR 4: FISHERIES

The fisheries sector is an important contributor to the economy of the UT of DNH&DD, located on the western coast of India.

The fisheries sector in the UT has marine fisheries. The marine fisheries are dominated by traditional, small-scale fishing operations using motorized boats.

However, the fisheries sector in the UT faces several challenges, including overfishing, habitat destruction, and unsustainable fishing practices. In addition, the sector is also highly energy-intensive, with significant energy consumption involved in activities such as fishing, processing, transportation, and storage.

To address these challenges, there have been efforts to promote energy efficiency in the fisheries sector in the UT. These include the adoption of energy-efficient fishing techniques, such as the use of more fuel-efficient boats and gears, as well as the promotion of renewable energy sources such as solar power for onshore activities.

7.1 Strategy: Energy efficiency across value chain of fisheries

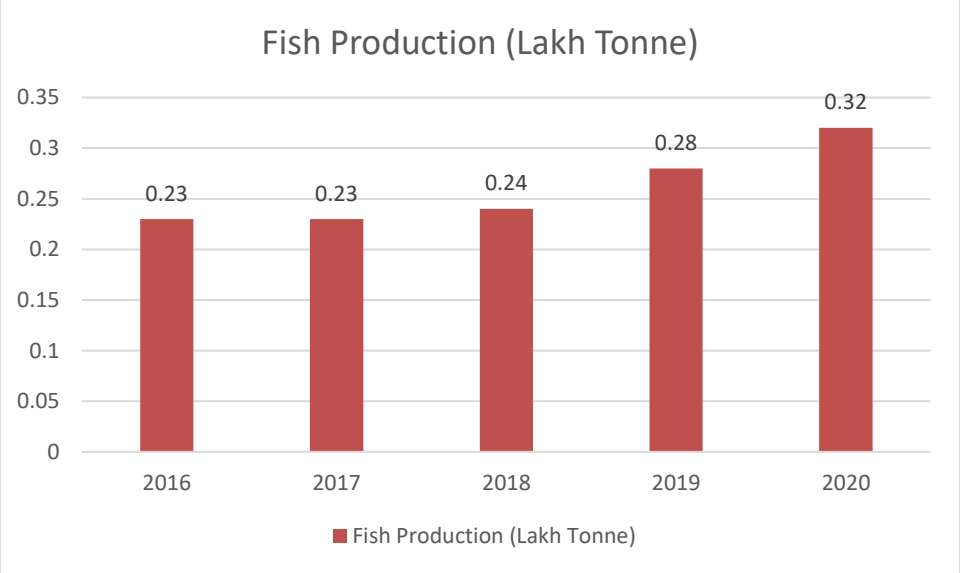
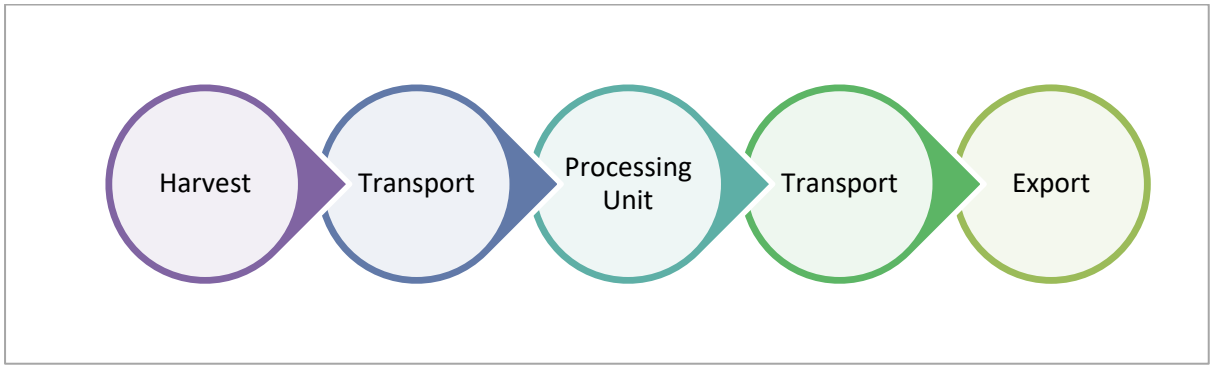


Figure 14 Fish production in the UT

The fisheries sector in India encompasses a wide range of activities, from fishing to processing, marketing, and distribution of fish and fish products. Improving energy efficiency across all value chains in the fisheries sector can lead to significant environmental and economic benefits, including reduced greenhouse gas emissions, decreased energy consumption, and cost savings for fishers and processors.



In the processing and packaging stages, energy is mainly consumed for cooling, freezing, and drying of fish products. The use of energy-efficient refrigeration and drying equipment can significantly reduce energy consumption and associated costs. Additionally, adoption of renewable energy sources such as solar and wind can further reduce energy consumption and greenhouse gas emissions.

The transportation and distribution of fish and fish products also require significant energy input, mainly in the form of fuel for vehicles and refrigeration systems. The use of energy-efficient vehicles and refrigeration systems, as well as improved logistics and distribution systems, can reduce energy consumption and transportation costs.

Overall, improving energy efficiency across all value chains in the fisheries sector in the UT can bring numerous benefits, including reduced greenhouse gas emissions, cost savings for fishers and processors, and increased competitiveness in the global market.

Scope Boundary

- Energy efficiency across value chain like harvest, transport, processing etc.

Implementing Agency

- Dept of Fisheries
- UT SDA

Below table showing the potential saving for fisheries sector in UT. By applying EE technologies i.e solar thermal storage system, EE engines, solar boats, etc UT can achieve 0.012 MTOE saving under ambitious scenario by 2030-31.

Table 30 Energy Saving Potential in Fisheries Sector

Particulars	Units	2019-20	2025-26	2030-31-31
Electricity Consumption	kWh/tonne	550	550	550
Fish Production	Lakh Tonnes	0.32	0.34	0.36
Fuel Consumption	MTOE	0.028	0.030	0.031
Energy saving-Moderate	%	15%	15%	15%
Energy saving-Ambitious	%	20%	20%	20%
Energy saving-Moderate	MTOE	0.004	0.004	0.0046
Energy saving-Ambitious	MTOE	0.006	0.006	0.0062

Energy Saving Potential

The energy saving potential has been estimated by accounting for both thermal and electrical consumption across harvest, land transport, processing unit chain.

Particulars	Moderate Scenario for 2030-31	Ambitious Scenario for 2030-31
Energy Saving Potential (MTOE)	0.0046	0.0062
GHG Emission Reduction Potential ($MtCO_2$)	0.0145	0.0193

Action Plans

This section describes several action plans that can be implemented across fisheries sector for this strategy. For each of the strategies, a short-, medium-, and long-term period has been taken into consideration for actionable instruments.

Policy Type/Schemes	Action Plan	Timeline
Awareness & Capacity Building	1. Provides skill development support. 2. Creating awareness Resource efficiency and cleaner refrigerant	Short Term
Technological Interventions	**Energy-efficient fishing vessels:** By adopting energy-efficient engines and reducing vessel weight, fuel consumption can be reduced. According to a study conducted by the Indian Council of Agricultural Research (ICAR), the use of energy-efficient engines in fishing vessels can reduce fuel consumption by up to 40%.	Short Term
	Efficient fish processing: By using energy-efficient equipment, optimizing cooling systems, and using renewable energy sources, energy consumption in fish processing can be reduced. According to a study conducted by the Ministry of New and Renewable Energy (MNRE), the use of energy-efficient fish processing equipment can reduce energy consumption by up to 30%.	Short Term
	Energy-efficient cold storage: By using energy-efficient cooling systems, insulation, and efficient lighting, energy	Short Term

	consumption in cold storage can be reduced. According to a study conducted by the ICAR, the use of energy-efficient cold storage equipment can reduce energy consumption by up to 25%.	
	Renewable energy sources: By using solar-powered boats for fishing and solar-powered cold storages, energy consumption in the fisheries sector can be reduced.	Short Term

Solar powered boats:

Solar powered boats get their energy from the sun. Using electric motors and storage batteries charged by solar panels and photovoltaic cells, solar powered boats can significantly eliminate their use of fossil fuels. Solar boats are uniquely suited to transform light energy into movement.

The main advantages are:

1. No fuel cost
2. No pollution from the burning of fuel
3. Less carbon footprint
4. Clean FRP surface
5. Wider boat and low rolling during fishing
6. More deck area
7. Suitable for shallow waters
8. No sound pollution

- Srav, a solar offshore fishing vessel designed and developed by Kochi-based NavAlt Solar and Electric Boats.
- It can host up to six fishermen. It has a 50-km range and is ideal for small fishers. The energy bill would be less than Rs 10,000, while fossil fuels would cost roughly Rs 3 lakh. Wear and tear too will be much less.

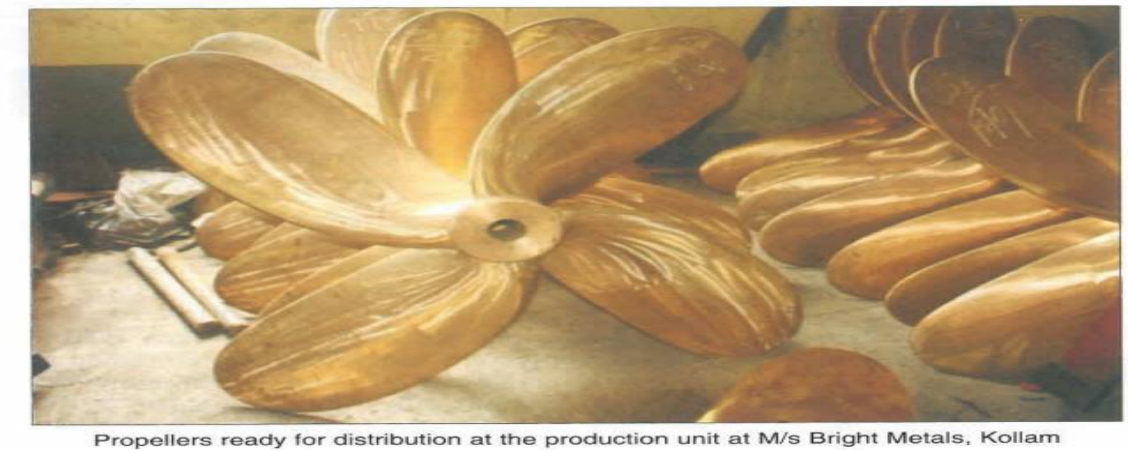
- *The Sagar Haritha vessel was constructed at the Goa Shipyard by CIFT under a public-private partnership model*

A hull made of marine grade steel to reduce weight and improve carrying capacity; a 400HP engine power, which is 20% lower compared with a regular vessel; a 600-watt solar panel for lighting; and bulbous bow, which reduces wave resistance on the sea, improving energy efficiency.

The Sagar Haritha designed by Central Institute of Fisheries Technology is an energy efficient fishing vessel

- *Improvement in blade element design of propellers provide fuel saving in ring seiners by 18-21%.*

With the improved propellers, a fuel saving of average minimum 750 liters of diesel per month of per boat can be obtained in fishing.



Propellers ready for distribution at the production unit at M/s Bright Metals, Kollam

Opportunities exist to improve energy efficiency, reduce use of HGWPR (high GWP refrigerants) and eliminate use of Ozone Depleting Substances (ODS) across the value chain in the following segments: primary transportation, cold storage, processing plant and reefer transport

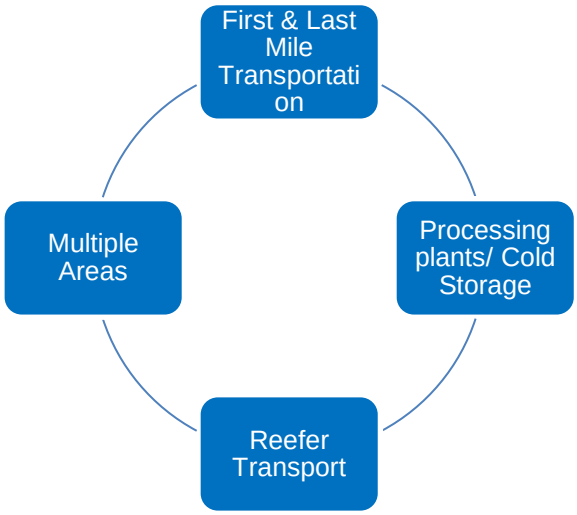


Figure 15 Focus area for fisheries cold value chain

Case Study: Energy Efficiency in fisheries value chain[25]

Energy & GHG Audit of selected Fisheries Sector Value Chains + Recommendations of Best/ Appropriate Transformation. Facilitating adoption of best energy efficiency and GWP + ODS reducing practices in fisheries sector cold chain and encouraging private sector participation

Project activities:

- Understanding the need and appraisal of local/ national and international best practices in existing cold chain processes towards energy efficiency (EE), and reduction of HGWPR and ODS
- Detailed energy audit of fisheries sector value chains in India
- Recommendations for improvement of the value chains.
- National Design Challenge for newer ideas – Mobile Kiosk for Fish Vending & Live fish transport.
- Stakeholder consultations to facilitate the adoption of best practices in the fisheries sector cold chain and encourage private sector participation

Impact: The purpose of the energy & GHG audit of selected value chains is to establish mass balance and estimate benchmarks of SEC, GHG emissions and energy consumption and to know the best practices in the value chain

Value Chain	Elements	Resource savings (%)				GHG
		Electrical energy	Thermal energy	Water	Ice	
Aquaculture shrimp	Farm	16%	-	-	-	15%
	Processing	7%	43%	3%	40%	10%
IMC	Farm	20%	-	-	-	19%

[25] PowerPoint Presentation (unep.org)

	Processing	8%	24%	18%	40%	13%
Finfish	Processing	11%	-	-	-	11%
Crab and Lobster	Processing	6%	-	-	-	5%

Some of the findings on major technologies practised in the cold chain are Phase change material technology in coolers to avoid delivery issues, solar PV systems for cold storage and EV to reduce emissions, Reefer trucks, aerators to Improve the quality of water, VFD for refrigeration systems, etc.

National Design Challenge for newer ideas is also conducted, where more than 150+ participants under each category from college students, innovators, start-ups, associations and practising officials in the sector. The main objective of the challenge was to get the best mobile kiosk for fish vending while maintaining the safety and hygiene of fish, and facilitate a circular economy based on reducing fish waste and energy efficiency.

The fishery value chain has been analysed through stakeholder consultation to help increase the private sector participation. It is recommended to,

1. Develop a compendium for investment potential & highlight current best practices in the fisheries sector that can be created across different supply chains and value chains
2. Organise B-to-B workshops and Matchmaking for the fisheries sector along with financing institutions
3. Implement pilot projects that can be replicated and case studies can be published to attract private investors to the sector

7.2 Monitoring mechanism

Following are the monitoring mechanisms that could be implemented to track the progress and effectiveness of the policies in the fisheries sector in the UT:

Policy Type	Monitoring Mechanism
Data Reporting	Remote sensing and GIS mapping: Remote sensing and GIS mapping can be used to monitor changes in ocean temperatures and salinity, which can affect fish distribution and abundance. These tools can also help identify areas where vulnerable fish species are concentrated.

8 FINANCING MODELS FOR ENERGY EFFICIENCY

Energy efficiency is one the most effective strategies to meet rising energy demand, reduce green house gas emissions and provide socio-economic benefits. Unlocking the potential of energy efficiency requires investments which can spur the technology availability in the market and adoption of energy efficiency among the end consumers. Many developed country has unlocked

energy efficiency financing potential through innovative financing models and some of such models are also being explored in India such as the Energy Service Companies (ESCOs) model. The present study analysed few popular financing models which can be helpful in commercial, residential as well as Industrial sector. Few financing strategy which are generally common in India are as given below;

- Financial Institutions (Credit, leasing)
- Microfinance Institutions (Credit)
- Dealer finance
- Financial Incentive (rebate/subsidy programs)

However, there are few other financing strategies which are being used world-wide and adopted in foreign countries are.

1. On Bill Financing Model
2. ESCOs
3. Leasing Model
4. Bulk Procurement

8.1 On bill financing model

On-bill financing can aid in increasing the household sector's adoption of climate-friendly and energy-efficient appliances (such as lighting, air conditioners, and refrigerators). Because it lowers monthly electricity costs and hence boosts purchasing power, it provides homes with a host of important advantages.

It has been demonstrated that basic energy efficiency measures like insulation, air sealing, heat pumps, and lighting upgrades produce an average energy savings of 25%. Through on-bill initiatives, an electric company or a third-party financier can cover the initial cost of energy-saving upgrades and equipment. Ratepayers can use a percentage of the savings realised as a consequence of the upgrades to pay down the cost of these investments through a monthly payment on their electric bill. On-bill financing makes energy-saving upgrades more accessible and affordable for consumers of all sorts and income levels by moving the initial costs to the utility.

Figure 16 Major common energy consuming appliances and equipment in Building sector

Energy efficiency is frequently the fastest-acting alternative to reduce the consumption of fossil fuels. The plan of delivering EE appliances to consumers may be more significant in order to offer them significant benefits. With the OBF model, consumers won't be put at a financial disadvantage because the payback is mostly funded by savings on electricity costs. The only party having an interest in the suggested model for using energy-efficient equipment will be the consumer.

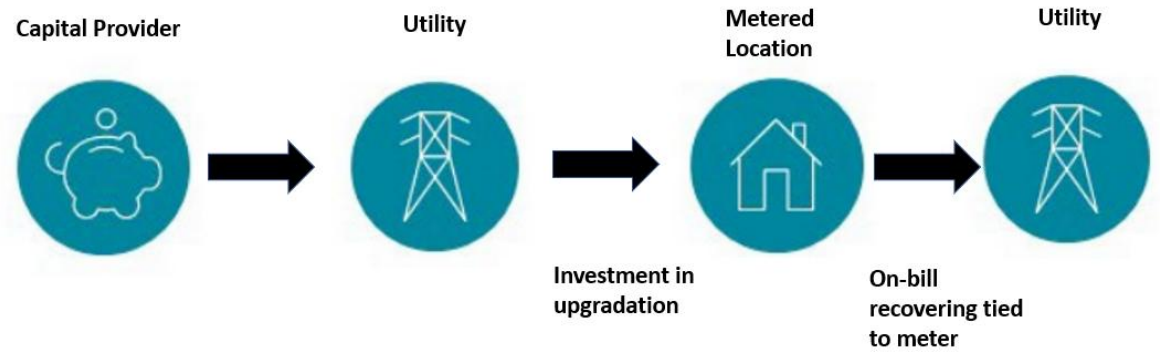


Figure 17 Modality of financing energy efficiency projects through on bill financing model

Improvements in efficiency of houses and buildings are treated by tariffed on-bill programmes as an investment in system dependability and as the creation of less expensive distributed energy resources. The utility makes investments and seeks cost recovery through tariffs using its recognised authority while utilising the current systems for sending bills and collecting money. The investment in energy savings is linked to the location rather than a specific customer up until the point at which the utility's investment is recouped. A tariffed investment does not increase the owner's debt profile the same way a bank loan would.

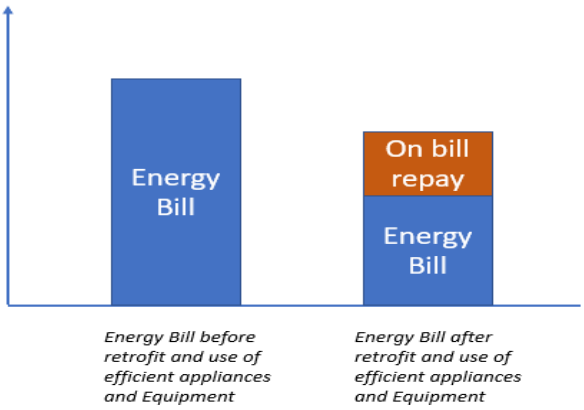


Figure 18 On bill financing structure

With adjustment of cost of appliances in monthly payment of electricity bills, this business model enables clients to access a wider choice of energy services, including demand response, electrification of transportation and heating systems, and efficiency enhancements.

Case Study: ECOFRIDGE-On bill financing

The government of Senegal (in 2020), in association with African Development Bank, United4Effciency, Renewable Energy and Energy Efficiency (ECREEE) &BASE offered efficient refrigerator and cooling product on EMI basis which was repaid through utility bills. The credit assessment of customer was done through their track record of payment of utility bill. As of Nov 2022, ECOFRIDGE GO model has achieved;

- Selling of 2527 new energy efficient ACs and emission reduction of 18824 MTCO2
- Total energy of 22,836 MWh energy saving
- Financing of 1 million USD

8.2 Energy service companies (ESCOs) Model of financing

Energy service companies (ESCOs) design, plan, construct, and secure funding for initiatives that lower energy use, energy expenditures, and maintenance and operations expenses at their clients' facilities. A project's technical and performance risks are typically assumed by ESCOs, who also serve as project developers for a wide variety of energy conservation measures (ECMs) (Energy Efficiency and Renewable Energy, n.d). Due to the fact that they employ the performance-based contracting model, ESCOs set themselves apart from other businesses that provide energy-efficiency solutions. The payment made to an ESCO for a project is closely correlated with the real energy cost savings.

The utility might be able to reach economies of scale that would further reduce costs with strong user acceptance and bundling that offers a kind of "mass customisation." To guarantee programme success, the utility would keep handling billing, quality control, monitoring, and reporting. Customers' invoices would show the improvement measures' net energy cost reductions versus service fees. Customers may think about upgrading for extra services like new windows or a refrigerator when the initiative started to show benefits.

- **ESCO in Industry**

Energy service companies (ESCOs) are becoming one of the most popular off-balance-sheet methods of financing in the energy efficiency sector. Depending on the needs of the client, ESCOs engage in a variety of activities, including, but not limited to, conducting energy audits of existing facilities, designing and implementing energy efficiency projects, locating opportunities to save energy, outsourcing energy infrastructure and technology, and directly funding or arranging the financing of energy projects (Ablaza 2019c).

Ownership of the energy asset or infrastructure may lie with the ESCO (or even a third party) rather than the energy end user, depending on the contracting arrangement. Energy performance contracting (EPC), which aids in reducing the financial and performance risk associated with energy efficiency projects, is being used by an increasing number of ESCOs. Although an equipment replacement or retrofit tries to lower total energy consumption, the energy savings that the end user actually experiences may differ from what was anticipated or promised for a variety of technical reasons.

In an EPC, the ESCO guarantees energy savings as long as predetermined operational and maintenance guidelines are followed. Processes for measurement and verification are also put in place to make it easier to calculate the actual energy savings. The ESCO reimburses the energy end user with an amount equal to the gap if the project doesn't achieve the guaranteed energy savings. Because utility rate volatility is a market-based risk that should be managed separately from the energy efficiency project, performance guarantees are usually linked to energy savings (e.g., kWh) rather than monetary savings. There are two models in Energy Efficiency.

- **Guaranteed Saving Model of ESCO**

The energy savings promised by the ESCOs carrying out the projects equate to cost savings. The host facility's owner pays the ESCO a predetermined amount based on the guaranteed energy savings from the project.

The ESCO covers the shortfall if savings fall short of the guarantee. The ESCO may receive (but is not guaranteed) a bonus payment if the savings are greater. The M&V protocol and the ESCO's payment terms will be laid forth in the ESPC. According to this concept, the host facility or facility owner may raise equity capital, and the FI will cancel the ESCO's debt. The host facility or facility owner then offers a loan. The facility owner/host facility then uses its savings to pay the FI's interest and loan repayments.

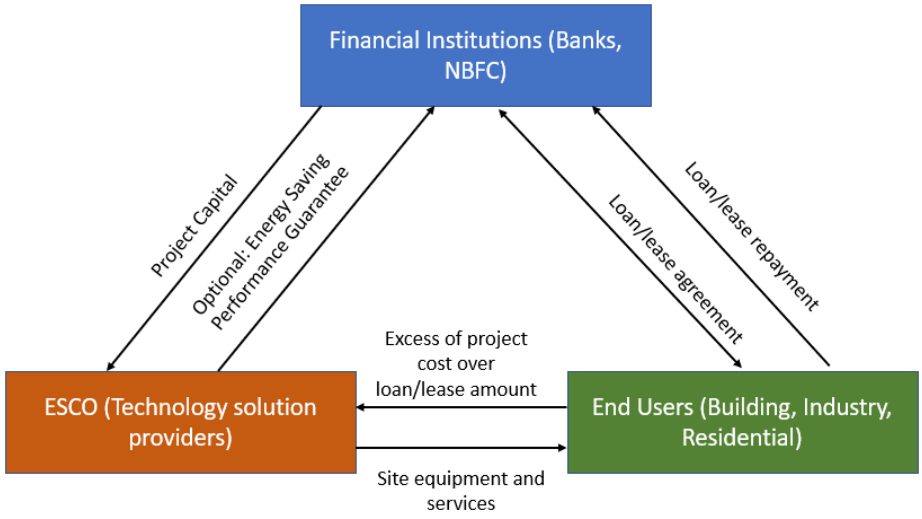


Figure 19 Guaranteed Saving Model

- **Shared Saving Model of ESCO**

Energy services companies deploy the Energy Savings Performance Contracting (ESPC) strategy in a turnkey manner. Design, engineering, construction, installation, commissioning, measurement, and verification are all part of ESCO services. Additionally, ESCOs handle training, financing, and operations and maintenance. The main criterion in this situation is to share the value of the energy savings, and this is what makes up the ESCOs' revenue stream. Beyond the duration of the contract, any savings are retained by the facility owner/host facility.

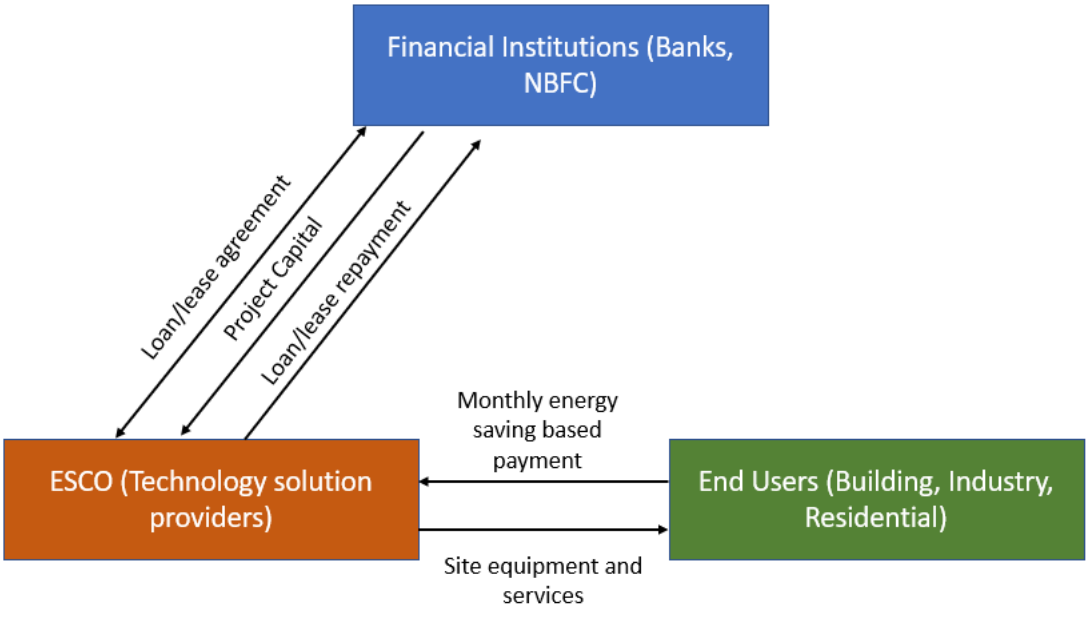


Figure 20 Shared ESCO saving Model

Various risk have been identified in the ESCO model through one of the research papers (Muhammad Ery Wijaya, et.al., 2021)

Table 31 Various Risk in ESCOs Models

Risk category	Impact	Likelihood
Economic and Financial	High	Medium
Finance resources	High	Medium
Operational and Behavioural	Medium	Low
Awareness	Medium	Medium
Measurement and verification	Medium	Medium
Technical solution and services	Medium	Medium
Technology	Medium	Low
Regulatory	High	Medium

Source: Climate Policy Initiative, 2021

8.3 Dealer or retailer financing model

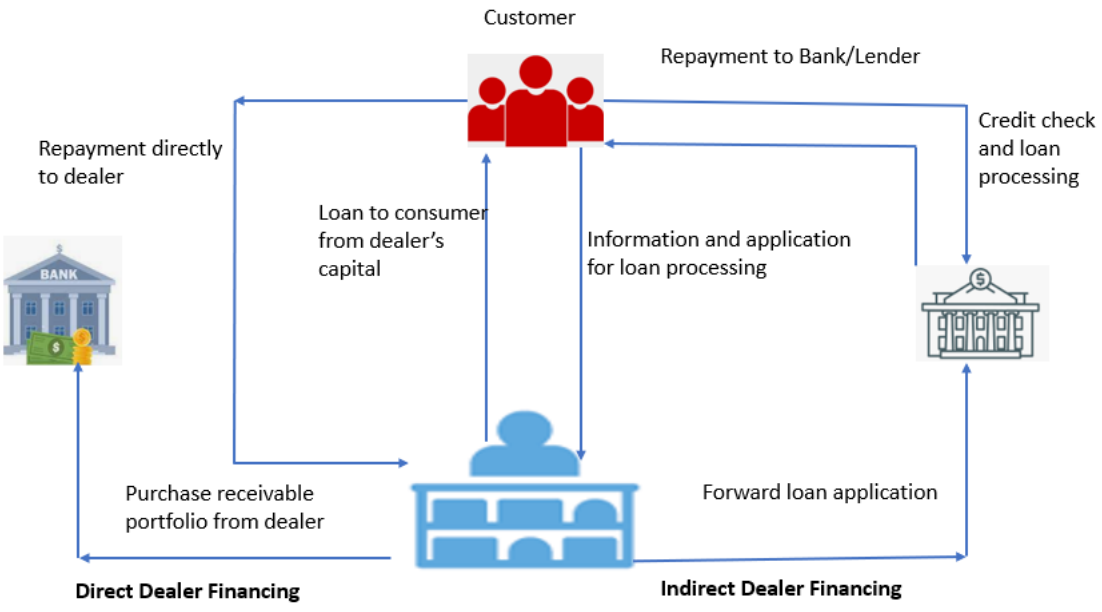


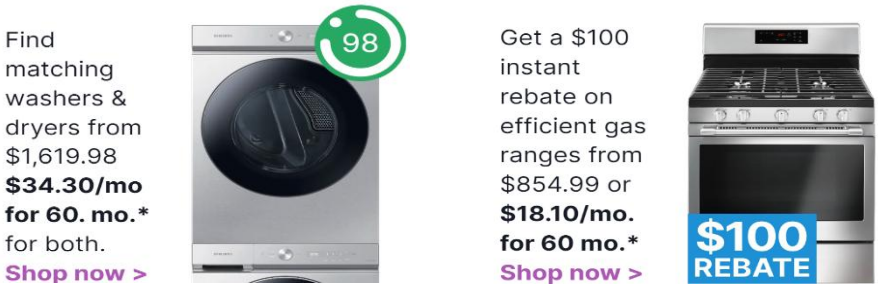
Figure 21 Dealer and retailer financing model

In direct dealer financing dealer directly provide loan to consumer or through partnership with third party financing institutions. Dealer can get access to finance by selling its purchase receivable portfolio to Bank. In indirect financing arrangement, dealer forward the consumer loan application form and other information to bank and bank access the credit worthiness of consumer before processing the loan. Consumer's repayment is directly to Bank and Dealer works as intermediary or facilitator.

Dealer financing lowers the cost of loan for consumers and easier access to credit facility. Dealer also helps the consumer to do all paper work, credit risk assessments etc. Dealer can negotiate with multiple finance provider for lending at discounted interest rates.

Case study: ECO-Financing Model by Enervee

Los Angeles based Enervee company, a provider of energy efficient appliances through online market place announced the ECO-Financing model for making energy efficient appliances affordable. The program was launched in collaboration with lenders Southern California Gas Company & the Sate of California. Enervee also partnered with best buy to provide end to end consumer services such delivery and installation. ECO-Financing model provided consumer favourable loan terms, low cost EMI, no down payment facility and instant rebate. Consumer could buy the product upto $ 5000. Initially it was targeted to reach 5.7 million consumers of SOCalGas and expansion later. Under this program consumer could purchase Clothes washers/dryers, dishwashers, kitchen appliances etc.



8.4 Leasing financing model

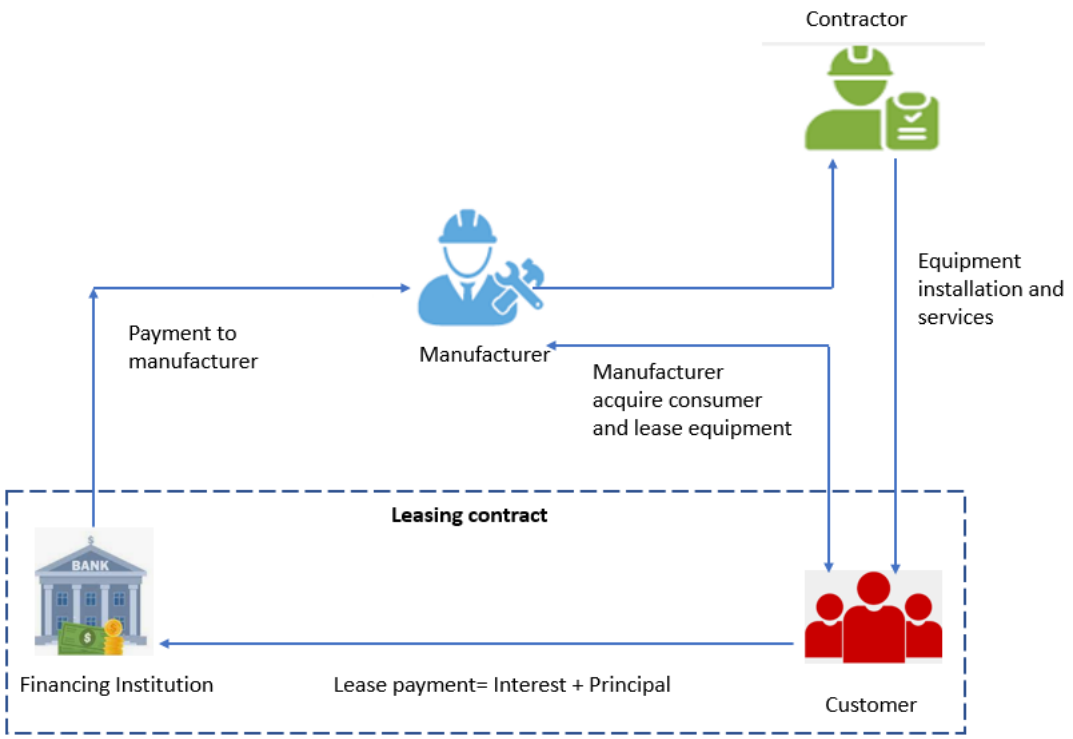


Figure 22 Leasing financing model

Leasing an asset-based financing where the financier (lessor) finances its assets to customer (lessee) for a fixed period of time through an agreement between lessor and lessee (IFC, 2009). In such model leasing is managed by partnership between financing institution, technology provider and contractor or service vendor. Manufacturer install equipment through contractor or service provider at the customer end. Equipment is financed by banking or financing institution where the customer pays fixed monthly instalment to Bank and Bank pays fixed monthly payment to manufacturer. Manufacturer takes liability for services, maintenance.

Case Study: Ultimate Home Comfort by York: A leasing model by Johnson Control

Johnson Control, provides smart and sustainable cooling and heating solutions for building. It launched a 10 years leasing program for HVAC system for residential buildings under its brand YORK. This industry led program provided owners a new, energy efficient system with no down payment and service warranty for 10 years and even at low monthly payment. It provided stress free cooling and heating services to homeowners with 53% saving in energy. Financing was provided by third party- Fundient Capital LLC and YORK covered its cost from customer through fixed monthly payment. York initially piloted leasing program in United State for three years and made many contractor its partners which increased its profit. At the expiry of the contract the customer had following options;

- Lease to own and pay balance pending amount of loan to financier
- No-renew and handover the equipment to financier
- New 10 year lease with new equipment
- Extension of lease for 2 years without maintenance and parts facilities

8.5 Utilization of green finance

Any structured financial activity that is intent to improve environmental outcome and enhance the access of finance for environmental benefit can be referred to as a green finance (World Economic Forum, 2020). Green finance directly linked with Environment Social and Governance (ESG) factor. Green finance benefits the broader context of the business rather than traditional source of finance which look at the profitability and cashflow. Grant is also a part of green finance generally provided by either Government or Internationally established institutions (Non-profit). Example: Government Environmental Facility (GEF) fund. GEF is an independent operating financing organization that provides grants for projects under climate change, biodiversity, land degradation etc. Grants has big role for enhancing energy efficiency adoption at large scale.

Case Study: CII's Dairy Project- Promoting Energy Efficiency and Renewable Energy in Selected MSME Clusters in India" initiated by GEF, BEE and UNIDO

In 2020 dairy cluster received grants for promotion of energy efficient technology under a program- "Promoting Energy Efficiency and Renewable Energy in Selected MSME Clusters in India" initiated by GEF, BEE and UNIDO.

The main objective of the project was to facilitate the implementation of energy efficient and renewable energy technologies in Rajasthan dairy clusters of India. The project of scaling up and expanding activities in Rajasthan dairy cluster had four major components:

- Component 1: Increasing capacity of suppliers in the category of Renewable and Energy efficient products.
- Component 2: Facilitate the implementation of energy efficient and Renewable energy technologies, best practices in MSMEs cluster of India.
- Component 3: Scaling up the project at national level.
- Component 4: Strengthening of policy, Institutional and decision making frameworks.

And key outcome of the project is as given below;

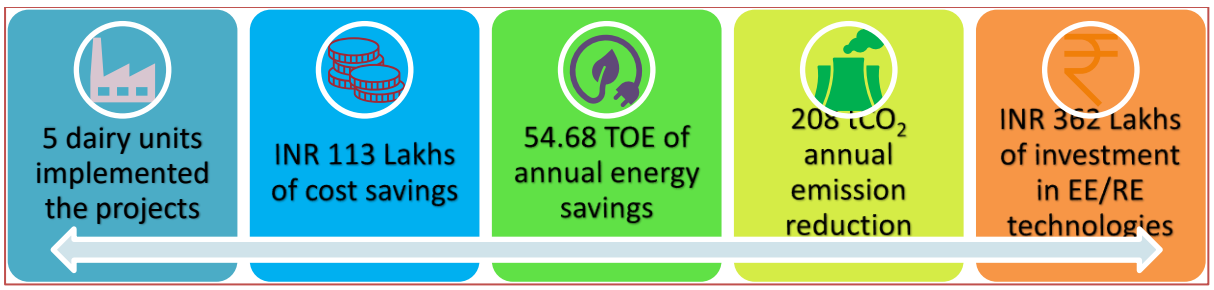


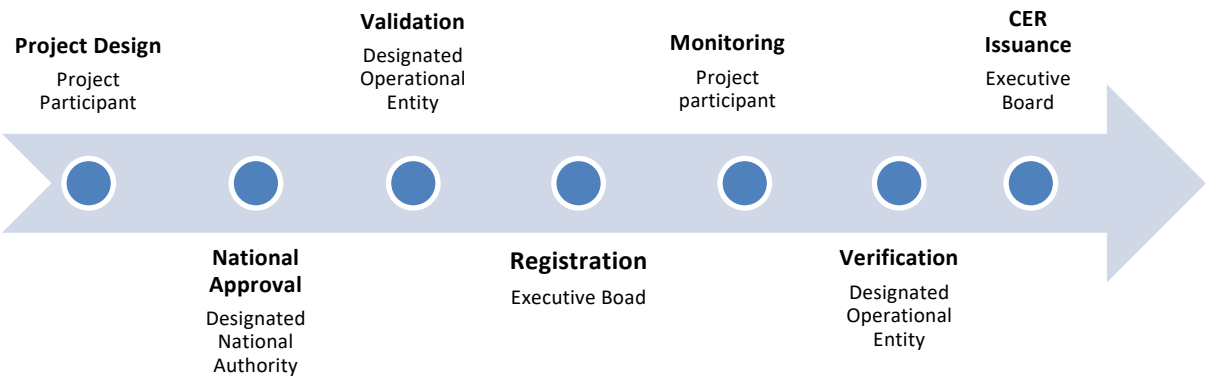
Figure 23 Key outcome of GEF funded Dairy Project

8.6 Carbon credit mechanism for energy efficiency projects

The Clean Development Mechanism (CDM) is a United Nations-run carbon offset scheme allowing countries to fund greenhouse gas emissions-reducing projects in other countries and claim the saved emissions as part of their own efforts to meet international emissions targets. It is one of the three Flexible Mechanisms defined in the Kyoto Protocol.

Energy efficiency projects implemented in India can be registered under the CDM mechanism to get tradeable carbon credits called the certified emission reduction (CER) credits. The typical project cycle under CDM is shown below,

Project Cycle under CDM



The government of India plans to develop the Indian Carbon Market (ICM) where a national framework will be established with an objective to decarbonise the Indian economy by pricing the Green House Gas (GHG) emission through trading of the Carbon Credit Certificates. Bureau of Energy Efficiency, Ministry of Power, along with Ministry of Environment, Forest & Climate Change are developing the Carbon Credit Trading Scheme for this purpose.

Case study: CFL lighting scheme – "Bachat Lamp Yojana" under CDM

The purpose of the Bachat Lamp Yojana (BLY) project activity is to replace the conventional incandescent lamps (ICLs) by compact fluorescent lamps (CFLs) in the residential grid connected households. Under the BLY scheme, up to four, long-life quality CFLs were distributed to grid-connected residential households in exchange of one ICL and INR 15 for one CFL.

The reduction in total power demand through the energy saving achieved has resulted a reduction of greenhouse gases (GHG) emissions that would otherwise being emitted during production of the equivalent amount of power in grid connected mostly fossil fuel based power plants.

In CFLs, the electrical current from the ballast flows through the gas, causing it to emit ultraviolet radiations. The phosphor coating converts the ultraviolet radiation emitted to visible light spectrum. CFLs are much more energy efficient than baseline ICLs. The efficiency of ballast-integrated CFL typically ranges from 51 to 56 lumen/ Watt, which is 4 to 5 times higher than an equivalent ICL. Consequently, CFLs consume only 1/4th to 1/5th of the energy used by baseline ICLs to provide the same level of light output. The 11W, 14W, 18W and 20W CFLs were distributed to households in exchange of equal number of normal luminous flux 60W and 100W ICLs, respectively. These CFLs have the equivalent or higher lumen to the replaced ICL (620lm and 1240lm, respectively) and a rated lifetime of 10,000 hours. These are also high power factor CFLs and they can withstand wide voltage fluctuations.

The distribution of CFLs and replacement of previously used ICLs in households in the component project activities (CPA) area was using one or more of the following methods:

- Direct installation at each household; and/or

- ICL collection and CFL distribution through dedicated distribution points as advertised by the CPA owner in the local media e.g. local DISCOM offices, retail outlets, resident association offices, schools etc.

implementation of the project has resulted in achieving 653,203 tonnes of CO2 equivalent of greenhouse gas emission reductions. Therefore, the CERs issued for the project are 653,203.

8.7 Bulk Procurement model

Procurement of appliances and equipment in large volume helps in achieving economies of scale and bulk procurement bring down the cost significantly and make it more affordable to end consumer. Bulk procurement model brings buyer and seller at a common platform where the manufacturer is able to generate profit through large volume and consumer gets product at lower price than market. Bulk procurement model providers negotiate with manufacturer and brings down the product price in multiple bidding round. The procurement costs are also down because of elimination of middle parties for selling the product in the market.

Bulk procurement model does not cover the financing requirements of consumer for purchasing the product rather brings down cost of the product.

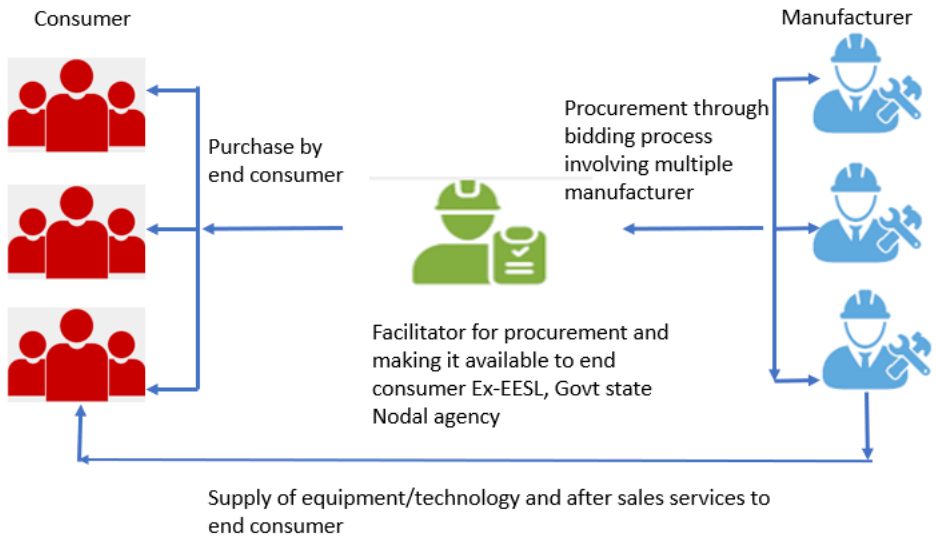


Figure 24 Bulk procurement model

Case study: Bulk Procurement model of EESL

Energy Efficiency Services Ltd. (EESL), targeted a program for replacement of standard motors with energy efficient motors for end consumers (PAT Industries and SMEs). The additional benefit of such bulk procurement model through EESL was the extend warranty of motors, Motor price reduction, information sharing on best practices and training to industries on operation and maintenance.

As shown in below table EESL, procured IE-3 motors, in bulk at price less than the market price and helped industries to save energy consumption and money.

Table 32 Bulk Procurement model by EESL

Motor specification (IE-3)	No of motors procured. (Nos Lakh)	Market price of Motor (Rs Lakh)	EESL Procured price (Rs Lakh)
1.10	0.15	0.08	0.05
1.50	0.15	0.08	0.06
2.20	0.15	0.11	0.07
3.70	0.15	0.14	0.09
5.50	0.15	0.20	0.13
7.50	0.15	0.23	0.16
11	0.10	0.47	0.25
15	0.10	0.49	0.31
22	0.10	0.65	0.40

9 INVESTMENT POTENTIAL

This chapter outlines the sectoral investment potential for each of the demand sectors.

	Emissions Reduction (MtCO2) - FY2030-31		Energy Consumption Reduction (Mtoe) - FY2030-31		Investment Potential[26]
Sector	Moderate	Ambitious	Moderate	Ambitious	INR Crores
	MntCO2	MntCO2	Mtoe reduction	Mtoe reduction	
Industry	0.233	0.415	0.072	0.134	247
Transport	0.101	0.116	0.032	0.037	68
Building	0.01	0.019	0.004	0.006	11
Fisheries	0.014	0.019	0.005	0.006	11
Total	**0.358**	**0.569**	**0.113**	**0.183**	**337**

The energy saving investment potential of the UT is estimated to be ₹337 crores by the year 2030-31, under the ambitious savings scenario, with the industry sector constituting highest energy saving investment potential followed by Transport sector.

[26] Market Potential calculated using cost of 1 tonne of oil equivalent as INR 18,402 and assuming a payback of 3 years.

10 WAY FORWARD

The “State Energy Efficiency Action Plan” report for DNH&DD provides a roadmap for the UT to achieve its energy efficiency goals. The report covers various sectors, including industry, buildings, transportation, and agriculture, and identifies opportunities for energy savings and greenhouse gas emissions reductions. The proposed strategies are formulated in a way to aid the UT in planning the resource allocation to achieve the UT’s targets in line with the NDCs. Moving forward, the UT is recommended to publish it as a formal guiding document to achieve energy efficiency and consider the proposed strategies as policy instruments while developing policies.

As a first step, moving forward it is important to create a task force or working group that will oversee the implementation of the action plan. This group should include representatives from government, industry, and non-governmental organizations, as well as energy experts and other stakeholders. The task force should be responsible for identifying priorities, establishing timelines, and monitoring progress.

Another critical step in moving forward is to secure funding for the implementation of the action plan. The UT should explore various funding options, including grants, loans, and public-private partnerships, to ensure that adequate resources are available to support the implementation of the plan. Additionally, the UT should consider developing innovative financing mechanisms, such as energy efficiency bonds, to attract private investment in energy efficiency projects. By taking these steps, UT can ensure that they are on track to achieving their energy efficiency goals and contributing to a more sustainable future.

To ensure the successful implementation of the proposed action plan, it is also important to provide the training and capacity building for all the stakeholders involved. This will enable the awareness creation among the stakeholders and adoption of energy efficient practices.

The proposed action plans across the sectors also requires innovation in technologies. Therefore, the government should also focus on encouraging the innovation and research in energy efficient technologies. This can be achieved by facilitating collaboration between industry and academia/ research institutes.

In conclusion, the State Energy Efficiency Action Plan report for DNH&DD provides a comprehensive framework for achieving energy efficiency goals in the UT. The successful implementation of the plan will require the involvement of various stakeholders and the allocation of sufficient resources. By adopting the above ways forward, the UT can achieve its energy efficiency goals, reduce greenhouse gas emissions, and contribute to a sustainable future.

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