

NATIONAL REPORT BY INDIA

APRIL 2020

Enhanced Black Carbon and Methane
Emissions Reductions

Arctic Council Framework for Action

National report by India

2020

to the Arctic Council Expert Group on Black Carbon and Methane

1 Introduction

A summary of 1-4 paragraphs, states may highlight their national priorities.

2 Black carbon emissions and future projections

2.1 Short summary of main findings on the historical and trends towards the future in emissions at state level. Also a short sectoral level descriptions on the historical and future trends, a paragraph per sector as relevant for each state.

Not Available

2.2 Informative graphs showing state emissions –

Not Available

Tables with data should be included in the annex, to help the technical team to aggregate numbers for the final Summary Report. See Annex 1 at the end of this document.

Not Available

3 Methane emissions and future projections

3.1 Top-down CH₄ emission estimations over India during 2010-2015 (Ganesan et al., 2017), come from five different observational sources over India: i) Satellite retrievals from the GOSAT platform: Data from the Greenhouse Gases Observing Satellite (GOSAT) was retrieved at National Centre for Earth Observation, UK. It has been providing column average dry-air mole fractions of methane (XCH₄) near-global coverage since its launch in January 2009 (Parker et al., 2015). The ground-based measurements of XCH₄ by Total Carbon Column Observing Network (TCCON) (Wunch et al., 2011) are used to validate GOSAT retrievals but no such validation was performed over India. Comparisons were instead made using surface mole fraction observations, which offer higher sensitivity to surface emissions than satellite retrievals but often with less spatial coverage.

Monthly CH₄ emissions from India are presented along with a 12-month running mean (Figure 1). Annual emissions are presented as the mid-point of the running mean each year. Top-down method estimated mean Indian emissions to be 22.0 Tg per year over the period 2010-2015. BUR-2 estimates mean Indian emissions to be 20 Tg per year over the period 2010-2014. Top-down CH₄ emissions estimated by Ganesan et al. (2017); suggest that there is little growth in Indian emissions during the period 2010-2014. These

results are strongly corroborated by India's second Biennial Update Report (BUR) to the United Nations Framework Convention (BUR-2) inventories as well (black solid line in Figure 1). Also, these two estimates are 30% smaller than reported in the comprehensive global CH₄ inventory, Emissions Database for Global Atmospheric Research (EDGAR).

3.2 Informative graphs showing state emissions –

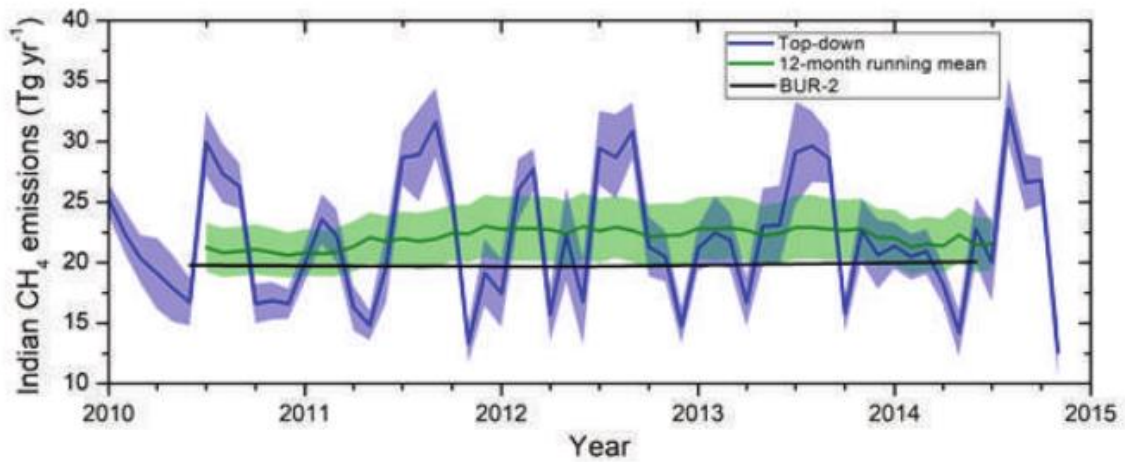


Figure 1: Comparison of India's top-down CH₄ emissions with BUR-2. Top-down estimated CH₄ emissions (as Tg yr⁻¹) (dark blue line). The green line and shading indicates a 12-month running mean of the top-down emissions. The black line corresponds to BUR-2 (Total with LULUCF).

Additionally, an assessment of loss rate of CH₄ over India is estimated based on MIROC4-ACTM model simulations (Figure 2). The observations of CH₄ concentrations from the remote background sites show large gradients between the northern and southern hemisphere (of about 130 ppb which is 8% of the global mean CH₄ concentration at 1700 ppb). This suggests the dominance of CH₄ emissions in the northern hemisphere. However, the removal of CH₄ from the atmosphere occurs mainly in the troposphere, up to 90%, due to the chemical reaction with hydroxyl (OH) radicals. OH is produced predominantly in the tropical atmosphere in the presence of water vapour and sunlight. Thus the removal of CH₄ takes place mainly in the tropical region. Using MIROC4- ACTM model simulations, CH₄ loss rate are estimated over India at 5.5 Tg/yr in year 2000 and 5.8 Tg/yr in 2016 (Patra et. al, 2014, 2016, 2018). This is about 1% of the global total loss rate in the period of 2000-2016, while the area of coverage was only about 0.73% of the globe.

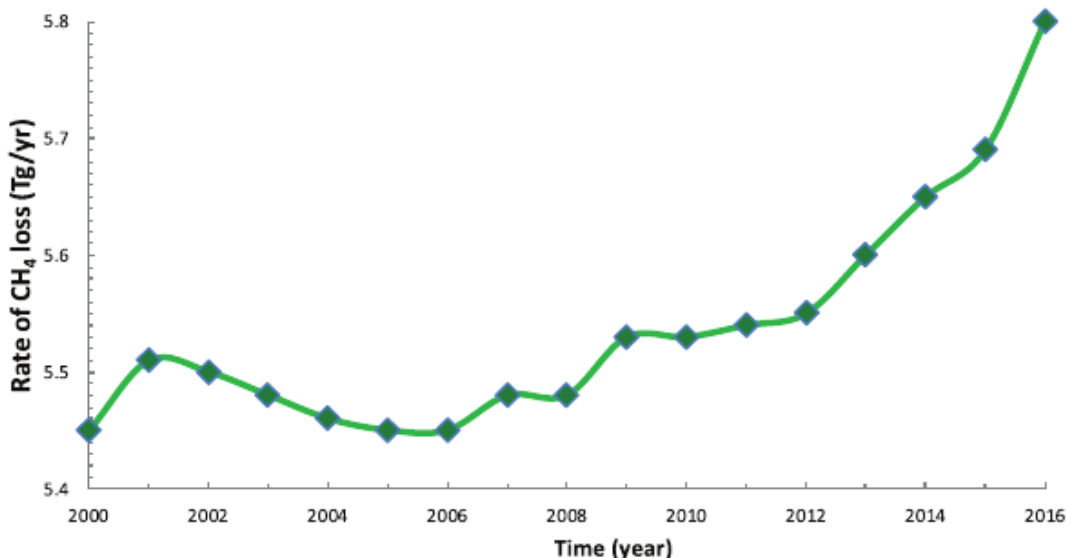


Figure 2: Rate of CH₄ loss approximately over the Indian domain (15.4-32.1°N, 73.1-87.2°E) covering an area of 3.71 M-km². The global surface area is 510 M-km² and the global CH₄ loss rate vary from 546 Tg/yr in 2000 to 579 Tg/yr in 2016.

4 National strategies and action plans

4.1 The Ministry of Environment, Forest and Climate Change is the nodal agency for environmental protection. Many other ministries including the Ministry of New and Renewable Energy, Ministry of Power and Ministry of Science and Technology undertake climate related activities. Most ministries and departments have been working in collaboration to implement and to achieve the goals set in the National Action Plan on Climate Change (NAPCC) which was launched in 2008 with eight National Missions. Each mission has a coordinating and implementing ministry. It is a multifaceted plan that covers the essential sectors with regard to climate change. The plan emphasizes on mitigation, adaptation, vulnerability, sustainability and also promotes stakeholder engagement in climate change action. On the lines of the

NAPCC, each State has prepared its own State Action Plan on Climate Change, toward achieving the National goal. To support the NAPCC, legal amendments have been carried out, wherever necessary, to improve monitoring and compliance under the missions.

4.2 National strategies :

India is committed to the implementation of mitigation policies and is proactively promoting low carbon and sustainable lifestyles. The decrease in the emission intensity of India’s GDP has been made possible through consistent efforts by the government towards establishing commensurate policies, institutions and capacities for the adoption of energy conservation and efficiency improvement practices across all sectors. Therefore, over the years, the Government of India and various state governments have undertaken proactive policies and measures. These efforts to implement the Convention, keeping in mind the national circumstances, have spanned across sectors and regions. Most of these policies and measures mitigate greenhouse gases directly or indirectly. In addition, increasing the share of cleaner and renewable energy sources such as solar, wind, nuclear, waste to fuels and biofuels in its energy mix through replacing the fossil fuels has contributed significantly to emission reduction. The Indian economy is, therefore, becoming greener through conscious actions, and there are efforts to enhance energy efficiency across the economy, increase the share of renewable energy and enhance forest and tree cover, while simultaneously meeting our development challenges in a sustainable manner. Substantial resources are being committed internally towards this each year. Climate change related activities have been further strengthened through the National Action Plan on Climate Change that has targeted missions on solar energy, enhanced energy efficiency and greening India.

4.3 National action plans

The National Action Plan on Climate Change (NAPCC) was launched in 2008 to address climate change concerns and promote sustainable development. There are eight National Missions, which form the core of the NAPCC. These represent “multi-pronged, long-term and integrated strategies for achieving key goals in the context of climate change”. Implementing the NAPCC requires appropriate institutional mechanisms for each of the missions. The targets and key achievements under these missions are highlighted in Table 1.

Table 1: Implementation of NAPCC

Mission and Description	Target/Deliverables	Key Achievements
Jawaharlal Nehru National Solar Mission: Aims at increasing the share of solar energy in the total energy mix through the development of new solar technologies.	<ul style="list-style-type: none"> • Achieve 100 GW of solar power by 2022. • Enabling policy framework for implementation of the mission • Promoting 2000 MW of off-grid solar applications, including 20 million solar lights by 2022 	<ul style="list-style-type: none"> • A cumulative capacity of 23,280 MW has been installed and commissioned till August 2018 and is continuously being increased. This includes solar rooftop and off-grid systems. Globally, India is on the 5th position in total solar power installed.

	<ul style="list-style-type: none"> • Creating a conducive environment for developing solar manufacturing capability in the country • Supporting research and development and capacity building activities • The target of 100 GW solar power is to be achieved in seven years starting from 2014-15, with 40 GW of grid-connected rooftop projects and 60 GW of large and medium land-based solar-power projects 	<ul style="list-style-type: none"> •Solar energy promotion through fiscal incentives such as capital and interest subsidies, generation-based incentives, viability gap funding (VGF), financing solar rooftop systems, concessional excise and custom duties, preferential tariff for power generation from renewable sources, foreign direct investment (FDI) up to 100%, and a Modified Special Incentive Package Scheme (M-SIPS). •Issuance of the renewable purchase obligation •Green energy corridors (GEC) with dedicated transmission system are being created. •194,700 solar pumps set up till August 2018. •45 solar parks in 21 states with aggregate capacity of 26,500 MW sanctioned.
<p>National Mission for Enhanced Energy Efficiency (NMEEE): The Mission aims to strengthen the market for energy efficiency by creating a conducive regulatory and policy regime. It envisages fostering innovative and sustainable business models.</p>	<ul style="list-style-type: none"> • Mandating specific energy consumption reduction in large energy-consuming industries, with a system for companies to trade energy-savings certificates. • Energy incentives, including reduced taxes on energy-efficient appliances. • Financing public-private partnership to reduce energy consumption through demand-side management programmes 	<ul style="list-style-type: none"> •Under NMEEE, Perform, Achieve and Trade (PAT) was launched in 2012. The first cycle of PAT (from 2012–15) resulted in an energy saving of 8.67 Mtoe and an emission reduction of 31 MtCO₂ (Details in Section 3.4.1). •In PAT Cycle II (2016–19), 621 Designated Consumers (DCs) from 11 sectors have been given Specific Energy Consumption (SEC) targets, with an intended energy saving of 8.869 Mtoe. The third PAT

	<p>in municipal buildings and agricultural sectors.</p> <ul style="list-style-type: none"> • NMEEE includes four initiatives: Perform, Achieve and Trade; Energy Efficiency Financing Platform; Market Transformation for Energy Efficiency; and Framework for Energy Efficient Economic Development. 	<p>cycle was notified in March 2017 to achieve an overall energy consumption reduction of 1.06 Mtoe. The fourth cycle of PAT has commenced from 1st April 2018 in which 109 DCs have been notified from the existing sectors of PAT and two new sectors namely Petrochemicals and Commercial Buildings (hotels).</p>
<p>National Mission for a Green India (GIM): Aims at enhancing ecosystem services and carbon sinks through afforestation on degraded forest lands in line with the national policy of expanding the forest and tree cover to 33% of the total land area of the country.</p>	<ul style="list-style-type: none"> • To increase forest/tree cover to the extent of 5 Mha and improve quality of forest/tree cover on another 5 Mha of forest/non-forest lands • To improve/enhance ecosystem services like carbon sequestration and storage (in forests and other ecosystems), hydrological services and biodiversity; along with provisioning services like fuel, fodder, and timber and non-timber forest products (NTFPs). • To increase forest based livelihood income of about three million households. 	<ul style="list-style-type: none"> • In the preparatory phase of GIM, a fund of ₹626 million was released during the financial years 2011–12 and 2013–14 to 27 states/UTs for undertaking preparatory activities, including institutional strengthening, training, identification of landscapes and preparation of perspective plans at the state/ UT level. • An amount of ₹1,439.6 million has been spent till March 2018. • Nagar Vana Udyan Yojana was launched to promote urban forestry. • Convergence guidelines of GIM with MNREGS and CAMPA have been framed.
<p>National Mission on Sustainable Habitat (NMSH): The mission attempts to promote energy efficiency in buildings, management of solid waste and modal shift to public transport including transport options based on biodiesel and hydrogen.</p>	<ul style="list-style-type: none"> • Development of sustainable habitat standards that lead to robust development strategies while simultaneously addressing climate change-related concerns. 	<ul style="list-style-type: none"> • Standards and guidelines have been developed for solid waste management, water and sanitation, storm water drainage, urban planning, energy efficiency and urban transport.

	<ul style="list-style-type: none"> • Preparation of city development plans that comprehensively address adaptation and mitigation concerns. • Preparation of comprehensive mobility plans that enable cities to undertake long-term, energy-efficient and cost-effective transport planning. • Capacity building for undertaking activities relevant to the mission. 	<ul style="list-style-type: none"> • Energy Conservation Building Code 2017 has been launched and is applicable to buildings 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. • Specific guidelines have been issued for enhanced lighting system efficiency. • Since 2015, new initiatives including AMRUT, Smart City initiative, HRIDAY, Swachh Bharat Mission, National Policy on Biofuels 2018, National Electric Mobility Mission Plan 2020 and National Urban Livelihoods Mission have been launched that would support NMSH.
<p>National Mission on Sustainable Agriculture: Aims to transform agriculture into an ecologically sustainable, climate-resilient production system by devising appropriate adaptation and mitigation strategies.</p>	<ul style="list-style-type: none"> • To make agriculture more productive, sustainable, remunerative and climate resilient. • To conserve natural resources through appropriate soil and moisture conservation measures. • To adopt comprehensive soil health management practices. • To optimize the utilization of water resources through efficient water management. • To develop the capacity of farmers and stakeholders. 	<ul style="list-style-type: none"> • A total of 1,59,813 ha of the area has been brought under System of Rice Intensification, and 1,62,274 ha has been brought under Direct Seeded Rice system till 2016-17. • 24.2 million tonnes of neem coated urea (as fertilizer) was manufactured in 2016-17, thus reducing N2O emissions • 99 climate resilient varieties have been identified in 2015-16.

<p>National Mission on Strategic Knowledge for Climate Change (NMSKCC): The mission intends to identify the challenges and the responses to climate change through research and technology development and ensures funding of high quality and focused research in various aspects of climate change.</p>	<ul style="list-style-type: none"> • Formation of knowledge networks among the existing knowledge institutions engaged in research and development relating to climate science and facilitate data sharing and exchange. • Establishment of global technology watch groups with institutional capacities to carry out research on risk minimisation technology selection for developmental choices Development of national capacity for modelling the regional impact of climate change on different ecological zones within the country. • Establishing research networks and encouraging research in the areas of climate change impacts. • Generation and development of the conceptual and knowledge basis for defining sustainability of development pathways. • Providing an improved understanding and awareness of the key climate processes and the resultant climate risks. • Creating institutional capacity for research infrastructure. 	<ul style="list-style-type: none"> • Department of Science and Technology, Government of India, has initiated several major R&D programmes in key areas of climate science, adaptation and mitigation. National and state level institutions are participating in these programmes. • Thematic knowledge network: Two National Knowledge Networks viz., a Network on Climate Change and Human Health and on Climate Modelling have been set up. Two more networks are being launched shortly: Network on Climate Change and Agriculture and a Network on Coastal Vulnerability. • Three centres of excellence one each in Indian Institute of Science, Bengaluru; Indian Institute of Technology, Mumbai; and Indian Institute of Technology, Chennai have been setup. • Global Technology Watch Group programme has been initiated to bring out technology selection and prioritization in the climate change adaptation and mitigation areas. • Two Technology Watch Groups on Renewable Energy and Advanced Coal Technology have been setup with National Institute of Advanced Studies, Bengaluru
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		<p>and Indian Institute of Technology, Chennai as lead institutions.</p> <ul style="list-style-type: none"> • State Climate Change Centres in Madhya Pradesh and Punjab have been set up.
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5 International work

International Solar Alliance (ISA)

International Solar Alliance (ISA) was launched by the Prime Minister of India and the President of France during the 21st session of Conference of Parties to UNFCCC at Paris, France. ISA brings together potential 121 solar resource-rich countries lying fully or partially between the Tropic of Cancer and the Tropic of Capricorn to optimize the use of available solar resources to meet their respective energy needs. The Paris Declaration signed during CoP-21 underlined the need to undertake innovative and concerted efforts for reducing the cost of finance and technology to promote immediate deployment of competitive solar generation capacity in ISA member countries. It was agreed to mobilize more than USD 1,000 billion of investments by 2030 to facilitate a massive deployment of affordable solar energy while paving the way for future solar generation, distribution and storage technologies to meet the respective needs of ISA member countries.

Mission Innovation

Mission Innovation (MI) is a global initiative to accelerate widespread public and private clean energy innovation for an effective long-term global response towards climate challenge. The aim is to provide affordable and reliable energy for everyone and promoting economic growth, which is critical for energy security. India, along with 22 other countries and the EU is a member of all seven MI challenges for clean energy development and is a co-lead in three challenges on smart grid, off-grid and sustainable bio-fuel. Department of Biotechnology, Government of India, is the coordinating agency for MI programmes in India. Indian participation and progress has been appreciated and acknowledged by MI.

5.1 Highlight the main priorities for international work and major changes since the 2017 national reporting.

5.2 List international work if international work was not reported in the 2017 national report – one paragraph per work area.

6 Sector based plans and projects

Please refer to table 1.

6.1. Mobile and stationary sources

6.1.1. Specific national strategies

Short text on specific national strategies and policies related to mobile and stationary sources

6.1.2. Existing regulatory instruments

Short text on existing regulatory instruments.

6.1.3. Follow up of EGBMC recommendation (1.a-1.e)

Conclusions and assessment on how the recommendations have had effect (one paragraph for each recommendation if applicable). Please insert individual actions in regard to each of the recommendation in Annex 3.

If a recommendation doesn't apply, state "NA".

6.1.4. Best practices and projects (Toolbox)

Energy access and clean fuels

Energy access and clean fuels constitute two key areas of concern for the Government of India as these are closely related to fundamental aspects of the well-being of the population, especially women. Two of the flagship schemes of the Government of India are discussed in this section.

Pradhan Mantri Ujjwala Yojana

Pradhan Mantri Ujjwala Yojana (PMUY), launched in 2016, aims to safeguard the health of women and children by providing Below Poverty Line (BPL) families with a clean cooking fuel - LPG so that they do not have to compromise on their health by working in smoky kitchens or spend time collecting fuelwood.

Under this scheme, up to ₹1,600 of support per LPG connection is provided to BPL families. For ensuring women empowerment, especially in rural India, the connections are issued in the name of women in the households. Under this scheme, the original target was to release 30 million connections by the end of FY 2017-18, but as a result of efficient implementation, the target was overachieved. Till June 2018, 715 districts were covered, and 44.49 million LPG connections were released under the scheme (MoPNG, 2018). In addition, the target connections were also raised from 50 million to 80 million.

Story box

Avoiding crop residue burning

Crop residues are usually burned to clear the field for sowing of the wheat crop in time as delay in wheat sowing may result in reduced wheat yields due to the higher temperatures at the time of wheat harvest during the months of March and April. Farm equipment which can help farmers to take up timely sowing of wheat in the standing paddy residues was made available to the farmers directly and through custom hiring centres so that burning of paddy residues is avoided. Farm machinery banks has also been established which can support operations like sowing of the wheat crop in standing residues, baling of paddy residues and slashers which facilitate timely sowing.

A National Policy for Management of Crop Residues (NPMCR) was announced in 2014 which stressed on the control of crop residue burning to prevent environmental degradation and suggested formulation and implementation of suitable legislative measures to curb burning of crop residue. The National Green Tribunal through its judgement in December 2015, directed the implementation of NPMCR in the States of Rajasthan, Uttar Pradesh, Haryana and Punjab. It also directed the State Governments to immediately take steps to educate and advise the farmers through media, gram panchayats and corporations that crop residue burning is injurious to human health, causes serious air pollution and is now banned or prohibited by law. Every State Government is to evolve the mechanism for collection of crop residue, its transportation and utilization for appropriate purposes. After the implementation of NPMCR, an emission reduction of 0.26 MtCO_{2e} (from 2014 - 2016) has been achieved. In 2018, the Cabinet Committee on Economic Affairs has given its approval for the promotion of Agricultural Mechanization for in- situ Management of Crop Residue in the States of Punjab, Haryana and Uttar Pradesh and NCT of Delhi. The total outgo from the Central funds would be ₹11.51 billion (₹5.91 billion in 2018-19 and ₹5.60 billion in 2019-20).

Solar parks

The country's first solar park came up at Charanka village in Gujarat and world's largest solar park Shakti Sthala, with a capacity of 2,000 MW, is under installation at Pavagada, Karnataka. A solar park is a concentrated zone of development of solar power generation projects, providing developers an area that is well characterized, with appropriate infrastructure and access to related facilities. The target is to set up solar parks with 40,000 MW capacity of which about 26,694 MW has already been sanctioned comprising 47 solar parks in 21 states (MNRE, 2018).

[6.1 Oil and gas \(2.a-2.d\)](#)

The same content as under "Mobile and stationary sources", and continue with all sectors.

If a recommendation doesn't apply, state "NA".

[6.3 Residential combustion \(3a -3c\)](#)

If a recommendation doesn't apply, state "NA".

[6.4 Solid waste \(4a-4c\)](#)

If a recommendation doesn't apply, state "NA".

[6.5 Agriculture and animal husbandry \(5a-5c\)](#)

If a recommendation doesn't apply, state "NA".

[6.6 Management of wildfires \(6a-6d\)](#)

If recommendation doesn't apply, state "NA".

7 Annexes

Annex 1: Black carbon emission tables (Not Available)

Alternative 1	CLRTAP		2013	2014	2015	2016	...	Latest inventory year	2025
	(GNFR)	A_PublicPower							
		B_Industry							
		C_OtherStationaryComb							
		D_Fugitive							
		E_Solvents							
		F_RoadTransport							
		G_Shipping							
		H_Aviation							
		I_Offroad							
		J_Waste							
		L_AgriOther							
		Grand Total							
Alternative 2			2013	2014	2015	2016	...	Latest inventory year	2025
		Industry and power generation							
		Residential and other small scale stationary combustion							
		Fugitive (incl. Flaring)							
		Road transport							
		Shipping and aviation							
		Off-road transport							
		Field burning and agricultural wastes							
		Other							
		Grand Total							

Annex 2: Methane emission table (values in Gg)

	2010	2011	2012	2013	2014	2015	2016	...	Latest inventory year	2020	2030
Energy					2,133.37						
Industrial Processes					177.85						
Agriculture					4,709.78						
Land Use, Land-Use Change and Forestry					48.19						
Waste					2,984.35						
Other					0.33						
Total					20,053.54						
Total (without LULUCF)					20,005.35						

Annex 3: States are invited to annex a table listing all actions in regard to each of the recommendation in the 2019 Summary Report. Please group the actions by sector and each recommendation (please see the example below). Focus on new projects or projects now having effect. Please note that the 2017 and 2015 Summary Reports are publicly available on the [Arctic Council Open Access Archive](#), and you are welcome to refer to those reports.

For reference, please see the [Summary Report 2019](#), appendix 1 on page 56. The idea is that this annex in the national report will feed into a similar annex in the 2021 Summary Report.

Mobile and stationary diesel-powered sources

Table A1: Table A1: Status of recommended actions 2019 related to the reduction of emissions from diesel engines.

Recommendation 1a	Listing actions to reduce emissions from new diesel vehicles and engines, as listed in recommendation 1a
Recommendation 1b	
Recommendation 1c	
Recommendation 1d	
Recommendation 1e	

Oil and gas

Table A2: Status of the recommended actions 2017 to reduce emissions from on oil and gas production

Recommendation 2a	
Recommendation 2b	
Recommendation 2c	
Recommendation 2d	

Etc, continuing with all the six sectors and related recommendations.

Source:

India's Second Biennial Update Report to the United Nations Framework Convention on Climate Change (2018), Ministry of Environment, Forest and Climate Change, Government Conventioof India. ISBN: 978-81-938531-2-2

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