

CLIMATE CHANGE ASSESSMENT

I. BASIC PROJECT INFORMATION

Project Title:	Sustainable Urban Development and Service Delivery Program (Subprogram 2)
Project Cost:	\$400 million
Location:	India
Sector/Subsector:	Water and other urban infrastructure and services/ Urban policy, institutional and capacity development
Brief Description:	<p>Context of Vulnerability. The urban sector in India is vulnerable to the negative impacts of climate change with an insufficient infrastructure base and its sensitivity to changes in precipitation and temperature. The summer monsoon precipitation (June to September) over India has declined over the last decades and there has been a shift towards more frequent dry spells.^a Basic urban service such as water supply service is sensitive to these changes, as the availability of water sources is affected by rainfalls while higher temperature could increase water demand. The frequency of daily precipitation extremes has increased and is projected further increase with global warming,^a which will lead to more frequent and extreme floods and landslides damaging wide range of urban infrastructure including water supply, wastewater management system, and housing.</p> <p>Statement of Intent. As recognized in India's Intended Nationally Determined Contribution,^b developing climate resilient urban centers and enhancing energy efficiency are the key pillars identified under mitigation strategy. It aims to provide basic infrastructure services and a decent quality of life to its citizens by building a clean and sustainable environment. For adaptation, the government states its intention to tackle the adverse impact of climate change through enhancing efficient use of water and ensuring access to water.</p> <p>Program's contribution to climate. Many policy actions under the program are aligned with government's strategy to address climate change and contribute to climate adaptation through water resources conservation and drought and flood risk management. For climate mitigation, the program promotes energy efficiency and green innovative technologies to reduce greenhouse gas emission.</p>

^a Government of India, Ministry of Earth Sciences. 2020. [Assessment of Climate Change over the Indian Region](#). New Delhi.

^b Government of India. 2015. [India's Intended Nationally Determined Contribution: Working Towards Climate Justice](#). New Delhi.

Source: Asian Development Bank.

II. SUMMARY OF CLIMATE CHANGE FINANCE

Project Financing		Climate Finance	
Source	Amount (\$ million)	Adaptation (\$ million)	Mitigation (\$ million)
Asian Development Bank			
Ordinary capital resources (regular loan)	400.00	96.37	21.57
Total	400.00	96.37	21.57

Source: Asian Development Bank.

III. SUMMARY OF CLIMATE RISK SCREENING AND ASSESSMENT

<p>A. Sensitivity of Project Component(s) to Climate or Weather Conditions and the Sea Level</p> <ol style="list-style-type: none"> Water supply is very sensitive to changes in rainfall and changes in the variability of rainfall. To a lesser extent, water supply is sensitive to changes in temperature. Sensitivity to sea level rise depends on the project location of the facility to be implemented under the policy-based loan (PBL). Wastewater treatment is particularly sensitive to changes in extreme precipitation events as these can increase sewage spills and, depending on the specific location, flood risk of the facility. Higher temperatures might lead to reduced efficiency of treatment processes and increased sewage treatment requirements. Urban water bodies are by their nature (small size, shallow) very sensitive to changes in precipitation. Lower rainfall, at the vicinity or in the upstream contributing catchment, will lead to lower inflow in the water body. Increases in temperature might lead to less inflow and while increasing demand for water. <p>B. Climate Risk Screening</p> <ol style="list-style-type: none"> Temperature increases are expected across the entire country: <ul style="list-style-type: none"> Water supply will be challenged by the risk of increased water demand and reduced availability of water resources due to higher evaporation from catchments. Wastewater treatment will face the risk of reduced efficiencies: Urban water bodies might experience higher evaporation and lower water quality. Number of warm days and nights will increase up to 70%:^a <ul style="list-style-type: none"> Water supply, wastewater treatment and urban water bodies will face the same challenges as by increased temperature but somewhat more intense during these days. Heat waves are projected to be 3 to 4 times higher by the end of the twenty-first century:^a <ul style="list-style-type: none"> Water supply, wastewater treatments and urban water bodies will face same challenges as indicated under increased temperature but even more pronounced during those heat wave periods. An increase in mean precipitation is uncertain according to various climate projection:^a <ul style="list-style-type: none"> For the three program components (water supply, wastewater management, urban water bodies) there will be no major changes in risk if this increase in mean precipitation happens. A decrease in mean precipitation is uncertain according to various projection.^a If this will happen: <ul style="list-style-type: none"> Water supply will be at high risk of water shortages by a higher demand from users and a reduction in supply from rivers, streams and in the longer run from groundwater. Wastewater treatment will not be directly affected by such a decrease in mean precipitation.
--

- Urban water bodies will be confronted with the risk of lower inflow from upstream catchment areas.
6. Increases in **daily precipitation extremes** is quite likely to happen:^a
- Water supply facilities might experience increased risk by additional flooding.
 - Wastewater treatment plants might experience increased risk by additional flooding. Risk of spill of non-treated sewage will increase substantially.
 - Urban water bodies will not be directly affected by daily precipitation extremes, but their function as temporary flood prevention might be challenged.

Climate Risk Classification: *low*

C. Climate Risk and Adaptation Assessment

Urban water supply is very sensitive to climate change, especially changes in rainfall can have large impact. Since both the supply side as well as the demand side can be impacted, adaptation measures should be considered for both. The source of urban water in India depends to a large extent on groundwater sources and supply adaptation measures should focus on sustainable aquifer management. Demand side management, often seen as a potential for big savings, should be location specific evaluated. Risks of unrealistic expectations of water savings should be carefully considered and the rebound and reuse effects should be included.

Wastewater management will be impacted by climate change and specifically more frequent storm events and higher temperatures might impact the functioning of the system. Adaptation options in the context of this PBL should be analyzed at project/location specific level. In general wastewater projects should assess whether a centralized or a decentralized system will be more resilient against climate change. Issues to be assessed as adaptations in the design criteria should include: (i) increased risks in spilling due to storm events; (ii) efficiency losses by higher temperatures; and (iii) increased flood risk of the wastewater treatment plant itself.

Urban water bodies are very sensitive to climate change and especially reduction in rainfall might influence the extent to which those urban water bodies will be filled. Climate projections for India are not providing a clear picture in which direction long-term precipitation will change. However, whether long-term precipitation will increase or decrease, enlarged water bodies might be favorable: with lower rainfall, a larger storage capacity is favorable; with higher rainfall, flood control will be more effective with larger storage capacity.

Rainwater harvesting will be an important adaptation measure for individual houses to deal with future uncertainty in water supply. Moreover, rainwater harvesting can also reduce flooding during storm events. Since the pressure on sewerage systems will be reduced, it also contributes to decreasing spilling from wastewater treatment plants. Rooftop rainwater harvesting can be easily integrated in the reform area two: constructing affordable rental housing complexes. Projected changes in especially extreme rainfall events based on climate models should be considered when defining design criteria.

D. Climate Risk Screening Tool and/or Procedure Used

The procedure used for this climate change assessment is mainly through literature research. Both peer reviewed as well as some "grey" literature has been used. A mixture of literature in the specific Indian context and literature from developing as well as developed countries was examined. Since the exact location where projects will be implemented in the context of this PBL has not been defined yet, only general conclusions relevant for the entire country have been provided. It is highly advised that each specific project that will be implemented in the context of the PBL undergo a separate climate risk assessment to consider climate change aspects in the entire project design.

^a Government of India, Ministry of Earth Sciences. 2020. [Assessment of Climate Change over the Indian Region](#). New Delhi. Source: Asian Development Bank.

IV. CLIMATE ADAPTATION PLANS WITHIN THE PROJECT

Adaptation Activity	Target Climate Risk	Estimated Adaptation Costs (\$ million)	Adaptation Finance Justification
Policy Action 2.1: MOHUA and/or the state governments operationalized AMRUT 2.0 to achieve its objectives covering the following aspects: (i) More than 10 large states have commenced implementation of SWAPs outlining annual targets (2023–2026) for providing universal coverage of piped water supply through tap connections to all urban households, and sewerage and/or septage connections in AMRUT towns through 6,125 projects with estimated financial outlay of about \$16.3 billion;	See risks under policy actions 2.1 (iii) and (iv), and 2.5.	9.30 ^a	Approval of state water action plans is the prerequisite for implementing AMRUT2.0 reforms at the state level. Adaptation finance is estimated to be proportionate to the total of policy actions 2.1 (iii) to (v) and 2.4 to 2.7 against the cost of this policy action of \$29.00 million.
(ii) in accordance with the MOU signed between MOHUA, 3,738 ULBs in more than 10 large states are carrying out reforms under AMRUT 2.0 and states are allocating funds to ULBs annually based on identified financing gaps;	See risks under policy actions 2.1 (iii) and (iv), and 2.5.	9.30 ^a	The MOUs are prerequisites for the implementation of AMRUT2.0 reforms at the state level. Adaptation finance is estimated to be proportionate to the total of policy actions 2.1 (iii) to (v) and 2.4 to 2.7 against the cost of this policy action of \$29.00 million.
(iii) more than 10 large states operationalized policy guidelines by inclusion of 95 projects in the SWAPs for recycling and reuse of treated used water to meet 20% of water demand of ULBs and 40% of aggregate industry water demand at state level;	Rainfall variability increases the risk of drought.	10.15	Reuse of treated wastewater will contribute to the conservation of water resources contributing to increased climate resilience. Thirty-five percent of the cost of this policy action of \$29.00 million is estimated as adaptation finance.
(iv) 1,148 ULBs in more than 10 large states have commenced implementation of action plans (2023–	Temperature increase will result in higher water demand and need for	10.15	Reducing NRW will contribute to the conservation of water resources, contributing to increased climate

Adaptation Activity	Target Climate Risk	Estimated Adaptation Costs (\$ million)	Adaptation Finance Justification
2026) for continuous water supply with NRW reduction; and	efficient use of water resources.		resilience. Thirty-five percent of the cost of this policy action of \$29.00 million is estimated as adaptation finance.
(v) more than 10 states implemented a policy or government order on user charges for water supply and sewerage with periodic increase to recover operation and maintenance costs for sustainable operations and improve collection efficiency.	See risks under Policy Action 2.1 (iii) and (iv).	10.15	The policy action ensures the sustainability of policy actions 2.1 (iii) and (iv). Adaptation finance is estimated to be proportionate to the total of policy actions 2.1 (iii) and (iv) against the cost of this policy action of \$29.00 million.
Policy Action 2.3: MOHUA rolled out eight e-learning modules to sensitize states and ULBs for inclusion of GESI components in urban water supply service delivery including climate and disaster resilience. The intended audience includes elected representatives and municipal functionaries, plant operators, plumbers, and workers, citizens including women and members of self-help groups at the ULB level, town planners as well contractors, managers, and consultants from the state and central ministry.	See risks under policy actions 2.1 (iii) and (iv), and 2.5.	2.90	Rollout of e-learning platform will improve knowledge of climate change adaptation at the state level. Twenty percent of the cost of this policy action of \$14.50 million is estimated as adaptation finance.
Policy Action 2.5: Following the policy instituted by MOHUA, more than 10 large states incorporated in their SWAPs proposals for time-bound implementation of 1,909 water bodies rejuvenation (2023–2026) to augment fresh water supply, increase green spaces, augment water conservation, reduce flood impacts, and maintain positive groundwater balance.	Extreme rainfall will increase the risk of flooding. Temperature increase will result in increased water demand and need for aquifer management.	10.15	Rejuvenation of water bodies helps in reducing flood impacts and is critical for aquifer management. Thirty-five percent of the cost of this policy action of \$29.00 million is estimated as adaptation finance.
Policy Action 2.6: 869 ULBs in more than 10 large states using groundwater as a source of water supply services incorporated waterbody rejuvenation in their city water action plans as part of a road map for groundwater recharge to conserve water resources and augment aquifer recharge for the sustainable use of groundwater.	See risks under policy actions 2.1 (iii) and (iv).	10.15	Sound groundwater management contributes to water resource conservation. Thirty-five percent of the cost of this policy action of \$29.00 million is estimated as adaptation finance.
Policy Action 2.7: 46 ULBs implemented policy guidelines to attract private sector participation in urban water infrastructure and services by inclusion of 57 PPP projects in the SWAPs with an estimated project cost of about \$850 million.	See risks under policy actions 2.1 (iii) and (iv).	5.08 ^b	PPP projects will support adaptation elements under policy actions under 2.1 (iii) and (iv). Adaptation finance is estimated to be proportionate to the total of policy actions 2.1 (iii) and (iv) against the cost of this policy action of \$14.50 million.
Policy Action 2.8: More than 10 large states complied with MOHUA's policy guidelines for the implementation of ARHCs, of which three states allotted houses by converting vacant government-funded 5,142 houses into ARHCs through PPP or by public agencies, and incentivized public or private entities to provide 82,273 units under ARHCs on their own property for providing shelter to urban migrant workers, industrial workers, working women, and the poor in urban areas.	See risks under policy action 2.9.	0.23 ^c	Adoption of the guidelines is the prerequisite to implementing policy actions 2.9 to 2.11. Adaptation finance is estimated to be proportionate to the total of policy actions 2.9 to 2.11 against the cost of this policy action of \$2.80 million.
Policy Action 2.11: 10 states complied with the policy guidelines under PMAY-U to include design features for older persons, women, children, and persons with disability in multistoried tenements, and provisions for rainwater harvesting system to promote sustainable building practices.	Decrease in precipitation will lead to water shortage	0.35	Rainwater harvesting is an important adaptation measure for managing uncertainty in future water supply. 25% of the cost of this policy action of \$1.40 million is estimated as adaptation finance.
Policy Action 2.12: More than 10 large states complied with operational guidelines issued by the government through an MOU with MOHUA that included a baseline for urban services as of 1 April 2021, and annual targets for achieving urban service delivery benchmarks until FY2026 in conjunction with investments planned under AMRUT 2.0.	See risks under policy actions 2.1 to 2.7.	13.51 ^d	Fiscal transfers are linked to adaptation elements under policy actions 2.1 to 2.7. Adaptation finance is estimated to be proportionate to the total of policy actions 2.1 to 2.7 against the cost of this policy action of \$45.60 million.
Policy Action 2.15: Government of India approved and rolled out operational guidelines for availing		4.94 ^e	Special assistance support adaptation elements under policy actions 2.1 to 2.11.

Adaptation Activity	Target Climate Risk	Estimated Adaptation Costs (\$ million)	Adaptation Finance Justification
special assistance for capital investments linked to urban planning and financing reforms to make ULBs creditworthy for issuance of municipal bonds.	See risks under policy actions 2.1 to 2.11.		Adaptation finance is estimated to be proportionate to the total of policy actions 2.1 to 2.11 against the cost of these policy actions (2.15, 2.16, and 2.17) of \$17.00 million.
Policy Action 2.16: Government of India operationalized guidelines to incentivize states through allocation of special assistance for integrated urban planning reforms including on enhancing the entire ecosystem of urban planning (legal, institutional, capacity building, and community awareness), town planning through land pooling, modernizing building by-laws, vertical agglomeration, strengthening natural ecosystem, comprehensive urban mobility (including transit-oriented development, transferrable development rights), affordable housing, and blue-green infrastructure.			
Policy Action 2.17: Government of India operationalized guidelines to incentivize states through allocation of special assistance for financing reforms in ULBs to make them creditworthy through property tax reforms to improve year-on-year collection by at least 20%, user charges reforms for water and sewerage services, and ring-fencing both property tax and user charges to support issuance of municipal bonds by large ULBs or pooled municipal bonds for smaller ULBs.			
Total adaptation finance		96.37	

AMRUT = Atal Mission for Rejuvenation and Urban Transformation, ARHCs = affordable rental housing complexes, FY = fiscal year, GESI = gender equality and social inclusion, MOHUA = Ministry of Housing and Urban Affairs, MOU = memorandum of understanding, NRW = nonrevenue water, PMAY-U = *Pradhan Mantri Awas Yojana* - Urban, PPP = public-private partnership, SWAP = state water action plan, ULB = urban local body.

^a The total adaptation finance of 2.1 (iii) to (v) and 2.4 to 2.7 is \$55.83 million against the total cost of \$174.00 million.

^b The total adaptation finance of 2.1 (iii) and (iv) is \$20.30 million against the total cost of \$58.00 million.

^c The total adaptation finance of 2.9 to 2.11 is \$0.35 million against the total cost of \$4.20 million.

^d The total adaptation finance of policy actions 2.1 to 2.7 is \$77.33 million against the total cost of \$261.00 million.

^e The total adaptation finance of policy actions 2.1 to 2.11 is \$77.92 million against the total cost of \$268.00 million.

Source: Asian Development Bank.

V. CLIMATE MITIGATION PLANS WITHIN THE PROJECT

Mitigation Activity ^a	Estimated Mitigation Costs (\$ million)	Mitigation Finance Justification
Policy Action 2.1: MOHUA and/or the state governments operationalized AMRUT 2.0 to achieve its objectives covering the following aspects: (i) More than 10 large states approved and commenced implementation of SWAPs outlining annual targets (2023–2026) with resource requirements and responsible agencies for providing universal coverage of piped water supply through tap connections to all urban households, and sewerage and/or septage connections in AMRUT towns through 6,125 projects with estimated financial outlay of about \$16.3 billion;	2.12 ^b	Approval of state water action plans is the prerequisite for implementing AMRUT2.0 reforms at the state level. Mitigation finance is estimated to be proportionate to the total of policy actions 2.1 (iii) to (v) and 2.4 to 2.7 against the cost of this policy action of \$29.00 million is estimated as adaptation finance.
(ii) in accordance with the MOU signed between MOHUA, states and ULBs, 3,738 ULBs in more than 10 large states implemented reforms under AMRUT 2.0 and states are allocating funds to ULBs annually based on identified financing gaps;	2.12 ^b	The MOUs are prerequisites for the implementation of AMRUT2.0 reforms at the state level. Mitigation finance is assumed proportionate to the total of policy actions 2.1 (iii) to (v) and 2.4 to 2.7 against the cost of this policy action of \$29.00 million is estimated as adaptation finance.
(iv) 1,148 ULBs in more than 10 large states approved and commenced implementation of action plans (2023–2026) for continuous water supply with NRW reduction; and	7.25	Reduced NRW will reduce energy consumption for treatment and pumping, contributing to less GHG emission. Twenty-five percent of the cost of this policy action of \$29.00 million is estimated as mitigation finance.

Mitigation Activity ^a	Estimated Mitigation Costs (\$ million)	Mitigation Finance Justification
(v) more than 10 states implemented a policy or government order on user charges for water supply and sewerage with periodic increase to recover O&M costs for sustainable operations and improve collection efficiency.	3.63	The policy action ensures the sustainability of policy actions 2.1 (iii) and (iv). Mitigation finance is assumed proportionate to the total of policy actions 2.1 (iii) and (iv) against the cost of this policy action of \$29.00 million.
Policy Action 2.7: 46 ULBs implemented policy guidelines to attract private sector participation in urban water infrastructure and services by inclusion of 57 PPP projects in the SWAPs with an estimated project cost of about \$850 million.	1.81 ^c	PPP projects will support mitigation elements under policy actions under 2.1 (iii) and (iv). Mitigation finance is assumed proportionate to the total of policy actions 2.1 (iii) and (iv) against the cost of this policy action of \$14.50 million.
Policy Action 2.12: More than 10 large states complied with operational guidelines issued by the government through an MOU with MOHUA that included a baseline for urban services as of 1 April 2021, and annual targets for achieving urban service delivery benchmarks (water supply, sanitation, rainwater harvesting, water recycling, etc.) until FY2026 in conjunction with investments planned under AMRUT 2.0.	2.95 ^d	Fiscal transfers are linked to adaptation elements under policy actions 2.1 to 2.7. Mitigation finance is estimated to be proportionate to the total of policy actions 2.1 to 2.7 against the cost of this policy action of \$45.60 million.
Policy Action 2.15: Government of India approved and rolled out operational guidelines for special assistance to states for capital investments linked to urban planning and financing reforms to enhance creditworthiness of ULBs to issue municipal bonds.	1.07 ^e	Special assistance supports policy actions 2.1 to 2.11. Mitigation finance is estimated to be proportionate to the total mitigation financing for 2.1 to 2.7 over the cost of policy actions for 2.1 to 2.11 against the cost of these policy actions (2.15, 2.16, and 2.17) of \$17.00 million.
Policy Action 2.16: Government of India operationalized guidelines to incentivize states through allocation of special assistance for integrated urban planning reforms including on enhancing the entire ecosystem of urban planning (legal, institutional, capacity building, and community awareness), town planning through land pooling, modernizing building by-laws, vertical agglomeration, strengthening natural ecosystem, comprehensive urban mobility (including transit-oriented development, transferrable development rights), affordable housing, and blue-green infrastructure.		
Policy Action 2.17: Government of India operationalized guidelines to incentivize states through allocation of special assistance for financing reforms in ULBs to make them creditworthy through property tax reforms to improve year-on-year collection by at least 20%, user charges reforms for water and sewerage services, and ring-fencing both property tax and user charges to support issuance of municipal bonds by large ULBs or pooled municipal bonds for smaller ULBs.		
Policy Action 2.8: More than 10 large states complied with MOHUA's policy guidelines for the implementation of ARHCs, of which three states allotted houses by converting vacant government-funded 5,142 houses into ARHCs through PPP or by public agencies, and incentivized public or private entities to provide 82,273 units under ARHCs on their own property for providing shelter to urban migrant workers, industrial workers, working women, and the poor in urban areas.	0.23 ^f	Adoption of the guidelines is the prerequisite to implementing policy actions 2.9 to 2.11. Mitigation finance is estimated to be proportionate to the total of policy actions 2.9 to 2.11 against the cost of this policy action of \$2.80 million.
Policy Action 2.10: MOHUA instituted a policy to provide technology innovation grant to support 127 innovative and replicable technologies (e.g., green and climate resilient, cost-effective, speedier implementation, or meeting diverse geo-climatic conditions) being applied to 13 projects under implementation.	0.35	PMAY-U will provide grants to eligible innovative green technologies to promote sustainable houses. 25% of the cost of this policy action of \$1.40 million is estimated as mitigation finance.
Policy Action 2.15: Government of India approved and rolled out operational guidelines for special assistance to states for capital investments linked to urban planning and financing reforms to enhance creditworthiness of ULBs to issue municipal bonds.	0.04 ^g	Special assistance supports policy actions 2.1 to 2.11. Mitigation finance is estimated to be proportionate to the total mitigation financing for 2.8 to 2.11 over the cost of policy actions for 2.1 to 2.11 against the cost of these policy actions (2.15, 2.16, and 2.17) of \$17.00 million.
Policy Action 2.16: Government of India operationalized guidelines to incentivize states through allocation of special assistance for integrated urban planning reforms including on enhancing the entire ecosystem of urban planning (legal, institutional, capacity building, and community awareness), town planning through land pooling, modernizing building by-laws, vertical agglomeration, strengthening natural ecosystem, comprehensive urban mobility (including transit-oriented development, transferrable development rights), affordable housing, and blue-green infrastructure.		
Policy Action 2.17: Government of India operationalized guidelines to incentivize states through allocation of special assistance for financing reforms in ULBs to make them creditworthy through		

Mitigation Activity ^a	Estimated Mitigation Costs (\$ million)	Mitigation Finance Justification
property tax reforms to improve year-on-year collection by at least 20%, user charges reforms for water and sewerage services, and ring-fencing both property tax and user charges to support issuance of municipal bonds by large ULBs or pooled municipal bonds for smaller ULBs.		
Total mitigation finance	21.57	

AMRUT = Atal Mission for Rejuvenation and Urban Transformation, ARHCs = affordable rental housing complexes, FY = fiscal year, GHG = greenhouse gas, MOHUA = Ministry of Housing and Urban Affairs, MOU = memorandum of understanding, NRW = nonrevenue water, PMAY-U = *Pradhan Mantri Awas Yojana*-Urban, PPP = public-private partnership, SWAP = state water action plan, ULB = urban local body.

^a While the policy actions are an enabler for reducing GHG emission actual GHG emission reduction will be realized through the implementation of downstream projects. GHG emission reduction, therefore, is not estimated.

^b The total mitigation finance of 2.1 (iii) to (v) and 2.4 to 2.7 is \$11.62 million against the total cost of \$159.36 million.

^c The total mitigation finance of 2.1 (iii) and (iv) is \$7.25 million against the total cost of \$58.00 million.

^d The total mitigation finance of policy actions 2.1 to 2.7 is \$16.92 million against the total cost of \$261.00 million.

^e The total mitigation finance of policy actions 2.1 to 2.7 is \$16.92 million against the total cost of policy actions 2.1 to 2.11 of \$268.00 million.

^f The total mitigation finance of 2.9 to 2.11 is \$0.35 million against the total cost of \$4.20 million.

^g The total mitigation finance of policy actions 2.8 to 2.1 is \$0.58 million against the total cost of policy actions 2.1 to 2.11 of \$268.00 million.

Sources: Asian Development Bank; Leslie A. Miller et al. 2013. Contribution of Water and Wastewater Infrastructures to Urban Energy Metabolism and Greenhouse Gas Emissions in Cities in India. *Journal of Environmental Engineering, American Society of Civil Engineers*. 139 (5). pp. 738-745; Government of India, Central Electricity Authority. 2021. [CO2 Baseline Database for the Indian Power Sector-User Guide Version 16.0](#). New Delhi; and A. Bhardwaj and R. Khosla. 2017. [Trends in India's Residential Electricity Consumption](#). Center for Policy Research. 7 November.