Accelerating investment in efficient and renewable district energy systems in Chile

Part I: Project Information

GEF ID
10087

Project Type
FSP

Type of Trust Fund
GET

CBIT/NGI
- ☐ CBIT
- ☐ NGI

Project Title
Accelerating investment in efficient and renewable district energy systems in Chile

Countries
Chile

Agency(ies)
UNEP

Other Executing Partner(s):
Ministry of Energy of Chile; Ministry of Environment of Chile

Executing Partner Type
Government

GEF Focal Area
Climate Change

Taxonomy
Focal Areas, Climate Change, Climate Change Mitigation, Energy Efficiency, Technology Transfer, Financing, Renewable Energy, Influencing models, Demonstrate innovative approache, Convene multi-stakeholder alliances, Deploy innovative financial instruments, Strengthen institutional capacity and decision-making, Transform policy and regulatory environments, Stakeholders, Beneficiaries, Local Communities, Private Sector, Financial intermediaries and market facilitators, SMEs, Large corporations, Capital providers, Civil Society, Academia, Community Based Organization, Non-Governmental Organization, Communications, Awareness Raising, Public Campaigns, Type of Engagement, Participation, Partnership, Information Dissemination, Consultation, Gender Equality, Gender Mainstreaming, Gender-sensitive indicators, Gender results areas, Participation and leadership, Capacity, Knowledge and Research, Targeted Research, Capacity Development, Learning, Indicators to measure change, Theory of change, Knowledge Generation, Innovation

Rio Markers
Climate Change Mitigation
Climate Change Mitigation 2

Climate Change Adaptation
Climate Change Adaptation 0

Submission Date
12/9/2019

Expected Implementation Start
12/31/2019

Expected Completion Date

12/31/2022

Duration

36In Months

Agency Fee($)

203,469

A. FOCAL/NON-FOCAL AREA ELEMENTS

Objectives/Programs	Focal Area Outcomes	Trust Fund	GEF Amount($)	Co-Fin Amount($)
CCM-1-3	Promote innovation and technology transfer for sustainable energy breakthroughs for accelerating energy efficiency adoption	GET	2,141,781	16,355,000
		Total Project Cost($)	**2,141,781**	**16,355,000**

B. Project description summary

Project Objective

Accelerate the decarbonisation of the heating sector in Chile by fostering the deployment of district energy systems

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
1. Establishment of a National District Energy Office (NDEO)	Technical Assistance	1. Municipalities and private developers plan, develop and promote district energy projects, with the support of the National District Energy Office (NDEO) **Indicator 1a:** National District Energy Office (NDEO) is established **Target 1a:** 1 **Indicator 1b**: Number of municipalities that develop district energy projects **Target 1b**: 5 municipalities	1.1. National District Energy Office (NDEO) established 1.2. National geographical database for district energy projects created 1.3. A methodological approach to support local governments and private developers is prepared and published in an internal procedure guidebook 1.4. Up to 10 projects are reviewed and their financial feasibility is improved	GET	192,265	319,500

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
2. Demonstration of financial feasibility of district energy projects	Investment	2. Chile has evidence from the successful tenders to review and calibrate its financial incentive schemes to include district energy	2.1 District energy financial incentives are reviewed to be included in a proposal for the National District Energy Financial Support Programme.	GET	1,596,635	15,278,000
		Indicator 2a: Number of revised financial schemes **Target 2a**: 1	2.2. Detailed project development undertaken to bring up to 3 pilot projects from pre-feasibility to tender			
		Indicator 2b: Amount of finance capitalized for district energy and support pilot activities **Target 2b**: At least US$ 10,000,000 capitalized and up to three pilot activities are supported	2.3. Calls for tender for the construction and operation of up to 3 pilot projects are launched and bidders selected			
			2.4. District energy master plan and investment roadmap developed with up to 3 cities with pilot projects selected to receive support from the National District Energy Financial Support Programme			

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
3. Designing an enabling regulatory framework at national and local level	Technical Assistance	3. Private investor's risk perception on district energy is reduced by incorporating clear guidance on district energy into national and local regulatory frameworks	3.1. Technical and planning regulations and standards on district energy are developed and prepared for adoption, considering national and international experiences and good practices	GET	121,800	157,500
		Indicator 3a: Number of technical and planning regulations or standards developed and prepared for adoption at national level **Target 3a**: 2	3.2. Guidelines for municipalities on how to incorporate the technical and planning regulations and standards of output 3.1 into the local regulatory framework are developed			
		Indicator 3b: Number of cities with new regulations or policy actions on district energy prepared for adoption				

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing($)	Confirmed Co-Financing($)
4. Outreach, trainings and dissemination of results to scale-up the market	Technical Assistance	4. Municipalities and the private sector have the knowledge and capacity to plan, develop and commercialize district energy projects.	4.1. Methodologies and tools to build capacity among local stakeholders on project development, including a cost-benefit tool, are developed and delivered	GET	129,550	500,000
		Indicator 4a: Number of additional requests to the NDEO **Target 4a**: 5 requests	4.2. Outreach campaign and awareness raising material is designed and disseminated to the stakeholders			
		Indicator 4b: Number of people trained in workshops disaggregated by gender **Target 4**: 50				
				Sub Total ($)	**2,040,250**	**16,255,000**
Project Management Cost (PMC)						
				GET	101,531	100,000

Project Management Cost (PMC)			
	Sub Total($)	**101,531**	**100,000**
	Total Project Cost($)	**2,141,781**	**16,355,000**

C. Sources of Co-financing for the Project by name and by type

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount($)
Government	Ministry of Environment (MoEnv)	In-kind	Recurrent expenditures	200,000
Government	Agency of Sustainability Energy (ASE)	In-kind	Recurrent expenditures	100,000
Government	Ministry of Energy (MoE)	In-kind	Recurrent expenditures	537,000
Government	Ministry of Housing (MoH)	Grant	Investment mobilized	15,000,000
Government	Ministry of Housing (MoH)	In-kind	Recurrent expenditures	50,000
Private Sector	Universidad Técnica de Chile (INACAP)	In-kind	Recurrent expenditures	300,000
Private Sector	Sociedad de Fomento Fabril (SOFOFA, Federation of Chilean Industry)	In-kind	Recurrent expenditures	100,000
GEF Agency	United Nations Environment Programme (UNEP)	In-kind	Recurrent expenditures	50,000
Others	Embassy of Denmark in Chile	In-kind	Recurrent expenditures	18,000
			Total Co-Financing($)	**16,355,000**

Describe how any "Investment Mobilized" was identified

Co-financing was identified through project/barrier assessments and in-depth discussions with Ministries and private sector operators. Co-finance will be provided in-kind (including co-financing of project management costs by the Ministry of Energy) and by the Ministry of Housing as part of a grant scheme of the Ministry to improve energy efficiency in buildings. The Ministry of Housing will reallocate 15,000,000 USD to improve overall primary energy efficiency in buildings situated in high potential areas for district energy with dedicated district heating technology investments. At international level, the Ministry of Energy has signed a collaboration agreement with the Embassy of Denmark in Chile to promote the development of district heating in Chile that could involve the support of the District Heating Danish Board and Danish companies.

D. Trust Fund Resources Requested by Agency(ies), Country(ies), Focal Area and the Programming of Funds

Agency	Trust Fund	Country	Focal Area	Programming of Funds	Amount($)	Fee($)
UNEP	GET	Chile	Climate Change	CC STAR Allocation	2,141,781	203,469
				Total Grant Resources($)	**2,141,781**	**203,469**

E. Non Grant Instrument

NON-GRANT INSTRUMENT at CEO Endorsement

Includes Non grant instruments? **No**

Includes reflow to GEF? **No**

F. Project Preparation Grant (PPG)

PPG Amount ($)
50,000

PPG Agency Fee ($)
4,750

Agency	Trust Fund	Country	Focal Area	Programming of Funds	Amount($)	Fee($)
UNEP	GET	Chile	Climate Change	CC STAR Allocation	50,000	4,750
				Total Project Costs($)	**50,000**	**4,750**

Core Indicators

Indicator 6 Greenhouse Gas Emissions Mitigated

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO_2e (direct)	330264	780000	0	0
Expected metric tons of CO_2e (indirect)	2096916	2600000	0	0

Indicator 6.1 Carbon Sequestered or Emissions Avoided in the AFOLU (Agriculture, Forestry and Other Land Use) sector

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO_2e (direct)				
Expected metric tons of CO_2e (indirect)				
Anticipated start year of accounting				
Duration of accounting				

Indicator 6.2 Emissions Avoided Outside AFOLU (Agriculture, Forestry and Other Land Use) Sector

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO_2e (direct)	330264	780,000		
Expected metric tons of CO_2e (indirect)	2096916	2,600,000		
Anticipated start year of accounting	2042	2042		
Duration of accounting				

Indicator 6.3 Energy Saved (Use this sub-indicator in addition to the sub-indicator 6.2 if applicable)

Total Target Benefit	Energy (MJ) (At PIF)	Energy (MJ) (At CEO Endorsement)	Energy (MJ) (Achieved at MTR)	Energy (MJ) (Achieved at TE)
Target Energy Saved (MJ)	4,047,760,000.00	5,700,000,000.00		

Indicator 6.4 Increase in Installed Renewable Energy Capacity per Technology (Use this sub-indicator in addition to the sub-indicator 6.2 if applicable)

Technology	Capacity (MW) (Expected at PIF)	Capacity (MW) (Expected at CEO Endorsement)	Capacity (MW) (Achieved at MTR)	Capacity (MW) (Achieved at TE)
select				

Indicator 11 Number of direct beneficiaries disaggregated by gender as co-benefit of GEF investment

	Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)
Female	5,420	1,500		
Male	5,420	1,500		
Total	10840	3000	0	0

Part II. Project Justification

1a. Project Description

Changes in project design

Describe any changes in alignment with the project design with the original PIF or concept note (i.e. changes in component, outcome or output wording, changes in GEF funds allocation per component/outcome, changes in co-finance commitments and allocation per component/outcome, etc.).

The project components and outputs have been refined based on consultations with key stakeholders during the project design phase / PPG. The changes as compared to the PIF are explained in the table below. In general, outputs and activities related to training and outreach activities have been moved from Outcome 1, 2 and 3 to Outcome 4 to consolidate these activities in one component. These changes will not, however, affect the project outcomes or objective. These changes are described below.

Changes related to Component 1:

As presented in the PIF (original text as per PIF)	**Revised text after PPG consultation**	**Description and justification of change**
"1. Municipalities have the knowledge and capacity to plan, develop and commercialize district energy projects"	"1. Municipalities and private developers plan, develop and promote district energy projects, with the support of the National District Energy Office (NDEO)"	Outcome 1 has been revised to reflect the consolidation of all training outreach activities under Component 4.
"1.5. Three high potential pilot projects are selected to receive support from the National District Energy Financial Support Programme"	The text for 1.5 is removed.	Output 1.5 has been integrated in the development of the National District Energy Financial Support Programme (NDEFSP) under Component 2. The establishing of the NDEFSP is a precondition for the selection of projects, hence the activity had to be moved to meet this order.
"1.6. Methodologies and tools to build capacity among local stakeholder on project development, including a cost-benefit tool are developed and delivered through three training workshops"	"4.1. Methodologies and tools to build capacity among local stakeholder on project development, including a cost-benefit tool are developed and delivered"	Output 1.6. has been moved to Outcome 4 and is now included Output 4.1. Moved to consolidate these training and outreach activities in one component under Component 4.

Changes related to Component 2:

As presented in the PIF (original text as per PIF)	Revised text after PPG consultation	Description and justification of change
"2.5. District Energy financial incentives are included and ready for disbursement in the Woodstoves Change out Programme and the Building's Thermal Retrofit Programme (co-finance)"	"2.1 District Energy financial incentives are reviewed to be included in a proposal for the National District Energy Financial Support Programme."	Compared to the PIF stage this output has been amended and generalised to an overall review of different potential existing financial programmes. Output 2.5 has been moved and introduced as Output 2.1 to the beginning of the component providing a necessary preparatory work for operationalisation the NDEFSP.
"2.1. Detailed project development undertaken to bring 3 pilot projects from pre-feasibility to tender" "2.2. Calls for tender for the construction and operation of the 3 pilot projects are launched and bidders selected"	"2.2. Detailed project development undertaken to bring up to 3 pilot projects from pre-feasibility to tender" "2.3. Calls for tender for the construction and operation of up to 3 pilot projects are launched and bidders selected"	The main goal of the Ministry of Energy and the ASE is to realise hardware investment in district energy system (DES) technologies in the pilot cities. Given the limited resources, it is proposed compared to the PIF to allow more flexibility to support *up to 3* pilot projects. This will help to react flexibly on the incoming project proposals and decide individually on the required support. In the end, one or two projects might be further advanced if the support is bundled and not necessarily spread over three projects.
"2.3. Fact sheets with lessons learnt and main technical and economic characteristics of the three pilots developed and disseminated".	"Deliverable(s) for Output 4.1.: […] 3. Fact sheets with lessons learnt and main technical and economic characteristics of up to three pilots developed and disseminated "	Output 2.3. has been moved to Outcome 4 and is now included in Output 4.1. Moved to consolidate these training and outreach activities in one component
"2.4. District energy investment roadmap developed with the 3 cities with pilot projects"	"2.4. District energy Master Plan and investment roadmap developed with up to 3 cities with pilot projects selected to receive support from the National District Energy Financial Support Programme"	Output 2.4 has been amended to cover the development of a district energy master plan and investment roadmap for the pilot projects. Under the output the targeted capital support is provided to the up to 3 pilot projects for the investments.

Changes related to Component 3:

As presented in the PIF (original text as per PIF)	Revised text after PPG consultation	Description and justification of change
"3.1. Synthesis report on technical and planning regulations and standards to be implemented at national and local level developed and delivered through a national validation workshop"	"3.1 Technical and planning regulations and standards on district energy are developed and prepared for adoption, considering national and international experiences and good practices"	The Ministry of Energy advanced on the regulatory work in 2018 and 2019. An analysis of existing national regulations to identify the areas where district energy could be incorporated has been conducted already (synthesis report). Feedback / stakeholder consultation with communities and private / investors sector have taken place. This activity was supported by a regulatory study funded by GIZ.
"3.3. Informative guide for private developers, investors and operators on revised technical and planning regulations and minimum standards for design, installation and operation of schemes delivered through a training session"	"Deliverable(s) for Output 4.1.: […] 2. Dissemination material, incl. informative guide for private developers, investors and operators summarizing technical and policy regulations framework for the private sector"	Output 3.3. has been moved to Outcome 4 and is now included Output 4.1. Moved to consolidate these training and outreach activities in one component

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Changes related to Component 4:

As presented in the PIF (original text as per PIF)	Revised text after PPG consultation	Description and justification of change
"4. Awareness is created for further district energy uptake"	"4. Municipalities and the private sector have the knowledge and capacity to plan, develop and commercialize district energy projects."	Outcome 4 has been revised to reflect the consolidation of all training outreach activities under Component 4.

"1.6. Methodologies and tools to build capacity among local stakeholder on project development, including a cost-benefit tool are developed and delivered through three training workshops" "2.3. Fact sheets with lessons learnt and main technical and economic characteristics of the three pilots developed and disseminated" "3.3. Informative guide for private developers, investors and operators on revised technical and planning regulations and minimum standards for design, installation and operation of schemes delivered through a training session" -	"4.1. Methodologies and tools to build capacity among local stakeholder on project development, including a cost-benefit tool are developed and delivered" "Deliverable(s) for Output 4.1.: 3. Fact sheets with lessons learnt and main technical and economic characteristics of up to three pilots developed and disseminated" "Deliverable(s) for Output 4.1.: 2. Dissemination material, incl. informative guide for private developers, investors and operators summarizing technical and policy regulations framework for the private sector"	Output 1.6, Output 2.3 and Output 3.3 have been moved to consolidate these tools and training activities in one Output 4.1 under Component 4.
"4.1. Outreach campaign and awareness raising material is designed and disseminated to the stakeholders" "4.2. Two awareness raising workshops and six webinars delivered"	"Deliverable(s) for Output 4.2.: 1. Outreach campaign and awareness raising material is designed and disseminated to the stakeholders 2. Two awareness raising multi-stakeholder workshops 3. Six webinars"	Output 4.1. and Output 4.2. have been moved to consolidate these outreach activities in one Output 4.2 under Component 4
"4.3. Website on district energy hosted by the Agency of Sustainability Energy developed and online, with best practices, outreach material, methodologies, guidelines and training material uploaded"	"Deliverable(s) for Output 4.2.: 4. Website on district energy hosted by the Agency of Sustainability Energy developed and online (in English and Spanish) (*co-financed*)"	Output 4.6 is incorporated under 4.2, however, it has been removed from the GEF budget request and is provided as co-finance by the Ministry of Energy. The Ministry of Energy is preparing a corresponding webpage.

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Changes in funding levels are reflected in the request for CEO Approval for both the GEF funding and co-financing as noted and explained in the following tables.

Project Component	GEF Project Financing in original PIF	GEF Project Financing in Request for CEO Approval	Comments
Component 1. Establishment of a National District Energy Office (NDEO)	$250,000	$192,265	Component 1: Output 1.5 has been moved to component 2 and Output 1.6 is now implemented under component 4. Hence, the budget of Component 1 decreased. Component 2: Output 1.5. of the PIF is now integrated in
Component 2. Demonstration of financial feasibility of district energy projects	$1,500,250	$1,596,635	

Component 3. Designing an enabling regulatory framework at national and local level	$160,000	$121,800	Component 2. The financial support under 2.4 has been optimized to leverage the maximal project investment impact. Component 3: Overall GEF budget decrease as some planned activities are already implemented since the PIF stage in co-finance contribution. Additionally, Output 3.2 in the PIF has been moved to Component 4. Component 4: Some costs initially attributed to Component 1, 2 and 3 have been reallocated under Components 4 reflecting the bundling of outreach and training activities under Component 4. Additionally, ongoing activities (webpage) and other are supported by project partners and co-financed. The overall budget for the component is more or less equivalent to the PIF stage.
Component 4. Outreach, trainings and dissemination of results to scale-up the market	$130,000	$129,550	

The reapportioning of GEF project financing to different project components reflects a more in-depth costing of project activities during the development of the request for CEO Approval and a deeper understanding of the specific activities and contributions that partners will co-finance.

The indicative co-financing in the PIF totalled US$ 16,305,000 from co-financiers from the government, academia and the private sector. This estimate was made based on discussions with co-financiers at the time the PIF was formulated. The indicative co-financing figures were re-assessed during the preparation of the request for CEO Approval and approved. The contribution of the Ministry of Housing was increased by US$ 50,000 covering its in-kind contribution to the project. Hence, the overall contribution will increase slightly to US$ 16,355,000 but considering the reallocation of work under the components also co-finance in-kind contributions is rearranged.

Project Component	Co-financing in original PIF	Co-financing in Request for CEO Approval
Component 1. Establishment of a National District Energy Office (NDEO)	$352,000	$ 319,500
Component 2. Demonstration of financial feasibility of district energy projects	$15,388,000	$ 15,278,000

Component 3. Designing an enabling regulatory framework at national and local level	$147,000	$ 157,500
Component 4. Outreach, trainings and dissemination of results to scale-up the market	$318,000	$ 500,000
Subtotal	**$16,205,000**	**$16,255,000**
PMC	$100,000	$100,000
Total Costs	**$16,305,000**	**$16,355,000**

Executing Agency

The Ministry of Energy and the Ministry of Environment will co-execute the project with the support of the Agency of Sustainability Energy (ASE). The ASE will be accountable to the Ministry of Energy for ensuring the Executing Agency activities. This is a change from the PIF, in which the ASE was not noted. For further information on the execution arrangements, see part II, section 6, and annex K.

1a. Project Description

1) Global environmental and/or adaptation problems, root causes and barriers that need to be addressed

Around 70% of the total energy consumption in an average city of central and southern Chile is used to cover heating and hot water needs. These needs are mostly met through inefficient and highly polluting woodstoves and/or individual gas boilers. Chile imports 60% of its primary energy, of which natural gas amounts to 20%, oil 45% and coal 35%. This heavy reliance on energy imports puts the country at risk of global energy market trends and uncontrollable climate events. Due to low regional electricity network interconnectivity, Chile is unable to import or export much electricity, and instead relies on fossil fuel imports and domestic generation.

Compared to other countries in Latin America, Chile is the fifth-largest energy consumer and its residential and industrial energy prices are among the highest in Latin America. According to the Ministry of Energy, 62% of the residential energy consumption is covered by wood and derivates like pellets, being its primary use heating and secondary use cooking. 96% of the households in regions of central and southern Chile, which account for over 50% of the total Chilean population, use woodstoves for heating, which generates major air pollution problems due to PM 2.5 emissions coming from wood combustion with high humidity, having caused over 30 episodes of pre-emergency and emergency every year in cities like Coyhaique, Chillán and Temuco. The plan for atmospheric decontamination regulates the utilization of wood stoves and prohibits their use during high pollution

episodes. The application of this plan resulted in 50 days of wood stoves prohibition in Temuco during the winter in 2016. The alternative technology used by households in these cases are kerosene, gas or electric individual heaters.

The country has also experienced an increase in the demand for hot domestic water, going from 52% in 2002 to 81% in 2010 according to a national study "Residential sector energy conservation curve"[1][1]. This figure is expected to raise due to the population growth and a greater accessibility, contributing to an increase of the total thermal energy consumption. The most common technology used for hot water supply are individual gas boilers. Gas prices in Chile are among the highest in South America, the gas bill during winter months for a 100 m^2 apartment in Santiago amounts to approximately 200 €/month (including hot water and heating), in a country where the average salary is around 700 €/month.

Both the problems raised due to air pollution coming from wood combustion, and the increase in energy consumption for space and water heating as a result of a higher urban density, require the implementation of solutions capable of improving air quality at the same time as meeting a growing thermal energy demand.

The assessments performed under the District Energy in Cities Initiative supported by the GEF and implemented by UNEP, in collaboration with the Ministry of Energy of Chile and the Ministry of Environment of Chile, confirm that district energy can be up to 50% more energy efficient, can reduce greenhouse gas (GHG) emissions by 90% compared to the business as usual scenario, and can be more cost-effective if an enabling framework is applied. Emissions from traditional woodstoves have an important impact on climate change, due to the black carbon (BC) present on PM2.5, estimated at 9,811 tonsBC/year (44% of total BC emissions in Chile) and equivalent to 8.9 million tCO_2, according to the national inventory of short lived climate pollutants.

Pollution coming from heating in the central and southern regions of Chile is one of the main environmental problems faced by national and local authorities. Despite the efforts made to reduce emissions from the heating sector at national and local level, there have not been made important improvements until now and cities are still critically polluted. Residential heating is based mainly on unsustainably managed and pollutant firewood, which generates serious air pollution levels. These emissions are responsible for 3,500 annual cases of premature death by cardiovascular diseases in Chile, health and social cost over 2,400 MMUSD/year and cost to the administration US$ 65 Million per year associated to reduction of labour productivity- according to the fourth environmental report from the Ministry of Environment 2018. Concentration of PM2.5 in the South of Chile is, in cities like Temuco, five times higher than the World Health Organisation's standards. 8 million people are exposed to PM concentration over the benchmark. In some cities, around 95% of this air pollution is attributed to wood burning for heating single-family homes, with high heating demand, inefficient and pollutant stoves and use of low-quality wood. Furthermore, the substitution of the traditional wood stoves by modern district energy systems would significantly improve indoor air quality, by eliminating the pollution resulting from inefficient combustion in old stoves.

District energy creates synergies between the production and supply of cooling, heating, hot water and electricity and can be integrated with municipal systems such as power, sanitation, sewage treatment, transport and waste. Modern district energy systems enable the use of low-quality thermal energy (waste heat) and higher shares of affordable renewable energy through economies of scale, diversity of supply, grid balancing and storage. Chile counts with vast renewable energy resources (biomass, solar, geothermal) that

could be harnessed through district energy as energy source for the heating sector. Waste heat from the industry or waste management facilities could easily be integrated in the country's energy mix thanks to district energy. Although biomass seems to be the easiest and cheapest renewable source for district heating in Chile, local private and public stakeholders are already exploring other alternatives. Some feasibility assessments considering waste heat recovery have already been undertaken showing very interesting results, and local research institutions are already working on the design of geothermal plants for district heating.

Despite the advances made in the last two years on increasing awareness on the benefits of district energy, the interest raised among local and international private companies, and the willingness of Ministries and municipalities to develop district energy in Chile, some root causes and barriers are still present, impeding the deployment of district energy and the initiation of the market.

Key root causes preventing the uptake of district energy systems in Chile are:

- *High-up front costs*, and the availability of polluting fossil fuel / biomass-based alternatives that require less investment cost up from, which make them appear more cost effective. High project development costs will likely stifle development and local governments may struggle to attract finance to district energy due to a lack of capacity in structuring and tendering such projects. Components 2 will address this root causes by providing financial support to cover project development costs and guidance to local governments on how to structure the project commercialization. This will provide necessary incentives to attract investment in residential areas that are the ones that pollute the most. The development of district energy masterplans under Component 2 is actually key in this regard as it allows to have a full picture of the potential for district energy in a city identifying high energy density areas and comparing them with the areas with higher air pollution to then develop a short-medium and long term strategy that integrates both. These strategies, like the one that is developed for Temuco, look at finding the right balance to attract private investors but also address the air quality problem, which means the average project return is lower. These strategies enable the identification if incentives or subsides are required to get the first projects in cities started.

- *Existing buildings have low energy efficiency and lack centralised heating systems:* Residential buildings in Chile generally have very low energy efficiency. Energy efficiency standards for new buildings started to be implemented in 2000 and improved in 2007 and they are weak compared to buildings energy efficiency standards applied internationally. The lack of good thermal insulation increases the building’s energy consumption and damages the business case for district energy by increasing the costs for end users, who will end up paying much more than what they are currently paying using cheap and bad quality firewood, and operators, who will increase the capital expenditure (CAPEX) and will risk over dimensioning the system. The lack of centralised heating system in the majority of buildings is another barrier for district energy, as some retrofitting would be required to install the internal distribution system, increasing the costs from the end-user perspective. Centralized systems are more common in hospitals, shopping centres and offices but less common in residential buildings. The implementation of energy efficiency measures combined with the installation of a modern heating system reduces or eliminates the end-user perception of an increase in the monthly heating bill. When the costs of buildings retrofit is a barrier for the deployment of district energy in high priority areas, the National District Energy Financial Support Programme (Component 2) will provide capital support to overcome this barrier.

The main barriers include:

- *Lack of capacity and resources of local governments:* Local governments have a key role to play in making district energy succeed. Their involvement, particularly in the development stages, can help realise the benefits of district energy, while also delivering jobs and growth in the region. Although there is a good level of technical knowledge

in the country, municipalities in Chile need expert support and guidance to building capacity for evaluating the different technologies available for district energy, conducting energy audits, include district energy in the urban planning, developing a district energy masterplan, performing project feasibility studies, preparing a procurement plan for a district energy project, issuing public calls for tender, and evaluating bidders. This barrier will be addressed through the Establishment of a National District Energy Office (Component 1), which will provide technical support and guidance to Municipalities and interested private developers, and the District Energy Financial Support Programme (Component 2), which will provide financial support to cover project development costs for a first round of demonstration projects and which will be managed by the Agency of Sustainability Energy of Chile.

- *High perception of risks and consequent high financial cost,* in particular by investors and financial institution: In Chile, where the commercial viability of modern district energy systems has not been proven, rates on debt can be prohibitively high, reducing the viability of projects. In the same context, as the market has not been yet developed, there is a high level of risk perceived by investors and financial institutions due to the lack of demonstration projects. Therefore, pilot projects will be critical to leveraging lower cost finance for district energy. Components 2 will provide financial support to cover project development costs and guidance to local governments on how to structure the project commercialization.

- *Lack of institutional coordination at national level* to promote the technology and disseminate best practice, standardized methodology and tools: The establishment of a National District Energy Office will have the mission of providing guidance to local authorities, developing and disseminating tools, methodologies and best practices among local authorities companies and end users, as well as tracking the environmental and social impacts and the evolution of the district energy market in Chile. All these activities will be covered under components 1 and 4.

- *Lack of an enabling regulatory framework*: The lack of a regulatory framework covering policies, measures, standards describe a missing enabling framework and increases the project's risks and has a deterrent effect on private investors. District energy projects often require of high up-front investment costs that the investor will need to get back through monthly payment of bills from consumers. The lack of a regulatory framework that stablishes clear rules for the market increases the risks for investors as consumers may decide to disconnect or stop paying for the service at any time without any guarantee. Also the lack of clear regulations on whether it is possible or not to build an energy generation plant of certain amount of installed capacity (MW) in the city and close to residential buildings can be perceived as a risk for a private investor: 1) One main barrier related with the regulatory framework is the uncertainty of sustainable concessions to use the ground for building DES systems. The ground is defined as a public good in Chile, i.e. the state is the owner and manager. Terms of the concession are still missing which relates to a risk for investors. 2) Another regulatory framework barrier is related to current urban planning. In several communes the installation of a plant for district energy near of the demand is not allowed. These are the main regulatory barriers currently in Chile. The current prevailing energy situation is based on wood and fossil fuels for providing heat. There is still a lack of policies and measures, which incentivize DES action and support the market creation. On the other hand, there is no general regulation that disincentivize the continuing use of non-sustainable wood in inefficient stoves (There are disincentives for use of wet firewood and inefficient stoves in the main cities in Chile through the Decontaminations Plans of the Ministry of Environment). District energy projects often require of high up-front investment costs that the investor will need to get back through monthly payment of bills from consumers. The lack of a regulatory

framework that stablishes clear rules for the market increases the risks for investors as consumers may decide to disconnect or stop paying for the service at any time without any guarantee. Also, the lack of clear regulations on whether it is possible or not to build an energy generation plant of certain amount of MW in the city and close to residential buildings can be perceived as a risk for a private investor. This barrier will be addressed through Component 3, of which initial and complementary activities have already started by the Government of Chile. This coupled with the National District Energy Financial Support Programme (Component 2) will help drive more projects to market.

- *Lack of awareness and misperceptions on district energy:* even though awareness on district energy has grown fast in the last two years in Chile, there are specific opportunities and benefits including its diverse technology applications and savings that are not well known, in particular by potential consumers who in the end are the ones that need to agree to connect to the network and the public sector, who can be seen as a potential consumer as well as developer. Further, misperception associated to district energy persists, such as: it is too expensive, the technology is only for developed countries, biomass is the only energy source that could be affordable for district heating in Chile. Lack of awareness raising on the opportunities of district energy can mean low public and investor confidence and interest, increasing risk, and reduced bankability of projects and effectiveness of policy implementation. Awareness of district energy and its benefits at different levels of government, local private sector and utilities, the general public, media organisations and finance institutions will be improved-upon through the project activities. Awareness campaigns delivered within component 4 using the results from the demonstration projects of Component 2 will improve awareness of district energy potential in Chile and its full benefits.

2) Baseline scenario and any associated baseline projects

In its NDC, Chile committed to reducing its CO_2 emissions per GDP unit by 30%-45% below 2007 levels by 2030. In addition, Chile has committed to the sustainable development and recovery of 100,000 hectares of forest land, mainly native, which will reduce carbon emissions by an annual equivalent of around 600,000 of CO_2 as of 2030.[2][2]

Chile has already made great efforts in the fight against climate change. Among these efforts is Law 20/25, which promotes the diversification of Chile's energy mix through the rollout of non-conventional renewable energy. A new, more ambitious target has been set to generate 20% of the country's energy and 45% of all electric generation capacity from renewable sources by 2025. Chile has also become a pioneer in the use of fiscal reforms to promote the mitigation of greenhouse gases (GHGs). A tax reform in 2014 charged fixed sources of electricity generation above 50 MW at a rate of 5 USD per ton of CO_2 as a disincentive. Additionally, a tax has been created to promote fuel-efficient cars.

Chile plans to meet its emission targets while simultaneously decreasing poverty and inequality through sustainable, competitive, and inclusive low-carbon development. To achieve these goals, the design of the energy agenda will include active participation of all sectors of society, including private and civil society. To face these challenges, the country understands the need to use its national capacities and international partnerships to eliminate the direct relationship between economic growth and growth of greenhouse (GHG) emissions.

The “Accelerating investment in efficient and renewable district energy systems in Chile” project will be undertaken in line with on-going policy actions such as the Energy Policy 2050, National Decontamination Plans, National Energy Route 2018-2022 and National Action Plan on Climate Change 2017-2022[3][3] among others, and will contribute to address country priorities and targets, such as urban air quality, low cost sustainable heating, energy efficiency, renewable energy use and sustainable cities.

The interest on district energy in Chile has grown exponentially in the last two years. The implementation of the District Energy in Cities Initiative’s programme (financially supported by the GEF-6), the engagement and contributions of the Ministry of Energy and the Ministry of Environment, the Mayors, and the commitment of the cities to develop pilot projects have raised awareness among private and public stakeholders.

The District Energy in Cities Initiative[4][4] is a multi-stakeholder partnership coordinated by UNEP, with financial support from the Global Environment Facility (GEF), DANIDA, and the Government of Italy. As one of six accelerators of the Sustainable Energy of All (SEforAll) Energy Efficiency Accelerator Platform, the Initiative is supporting market transformation efforts to shift the heating and cooling sector to energy efficient and renewable energy solutions. The Initiative is active in Chile since January 2017.

In addition, the proposed project supports planned mitigation action according to the National Action Plan on Climate Change 2017-2022, in particular:

- Action line 11. Mitigation actions for low carbon building, urbanization and public infrastructure
- In particular, mitigation action 26[5][5]: Evaluate the reduction of black carbon (BC) and carbon dioxide (CO_2) emissions through the implementation of the Atmospheric Decontamination Plans Strategy. The strategy includes three types of plans, of which one refers to district energy:
    - 2. Plans in central and southern areas, with intensive use of wood for heating, mitigation actions include:
        - a) Multi-location replacement to eliminate wood-fired heaters
        - b) Promotion and penetration of district heating
- Mitigation Action of the Energy Sector number 7[6][6]: Increase the consumption of more efficient and sustainable biomass fuels.
    - Promote the production and sustainable use of forest biomass for energy purposes to protect the natural heritage and health of people (strategic guideline No. 24 of the PEN).
    - Start collective heating pilots in areas that have Decontamination Plans and define business models that make their economic feasibility viable in order to move from individual heating to the collective in urban areas, where cost is effective.

In Chile the District Energy in Cities Initiative is focused on promoting district energy as a sustainable and cleaner alternative to individual heating systems (usually based on wood stoves) to reduce GHG, PM2.5 and PM10 emissions and improve air quality in cities. The Initiative is working with 12 cities (10 rapid assessments developed) to design bankable projects and supportive local policies to demonstrate and expand district heating technology, with support from the Ministry of Energy, the Ministry of Environment and the Ministry of Housing and the Federation of Chilean Industry (SOFOFA).

The Government of Chile would like to implement district heating as a key solution to mitigate air pollution and meet growing thermal energy demand; district heating has been identified as a technically feasible alternative to individual woodstoves as well as gas and water heating with benefits for communities and users. The private sector (private utility companies and real estate developers) is starting to identify district heating as a new business opportunity and some small-scale fully private pilot projects are being initiated. Furthermore, the Ministry of Energy and the Ministry of Environment, together with the District Energy in Cities Initiative, are currently defining a roadmap for the development of district heating. In addition to the assessments performed at local level, the National Heat Roadmap will enable policymakers evaluate the national potential of district heating and cooling in Chile and the priority areas on which to focus initial efforts and interventions (policy, incentives, demonstrative projects, etc.). The overall objective of the Chile Heat Roadmap is to guide policy and investments in the country and support Chile's efforts in making a market transition to renewable and efficient district energy solutions. The final report will be published in October 2019 and will comprise 1) a National Heat Map, 2) a District Heating Roadmap/Strategy and 3) the Mapping and description of project types in Chile, associated IRRs and replication potentials.

Several pre-feasibility studies on district heating have already been undertaken in different cities during the last years (see Textbox 1). These studies show that district heating is a technically and commercially feasible solution which could have a payback period of 8-10 years and offering numerous benefits to community and users, such as reduced emissions and concentration of PM 2.5 by 90%, savings in total energy consumption, security of supply and decreased dependency on fossil fuel imports. The studies undertaken in Temuco show that in areas with high energy density, district heating can be cheaper than using individual heating systems run on gas and/or pellets plus a gas boiler for hot water supply. Further to the 2,500 tCO_2/year emission reductions achieved by substituting gas hot water boilers by district heating, with the introduction of biomass[7][7] CHP the city will benefit from carbon neutral electricity generation that would otherwise be produced through imported fossil fuels, reducing CO_2 emission in an estimated amount of 60,000 tCO_{2eq} per year, and district heating systems would enable local renewable electricity production. However, these studies have also shown that there are numerous challenges and barriers to the implementation of district heating on a large scale in Chile.

Textbox 1: Summary of rapid assessments and pre-feasibility studies in Chile's cities

The assessments performed in the cities of Temuco, Coyhaique and San Pedro de la Paz revealed the potential of district heating as sustainable heating alternative to improve air quality and identified commercially viable potential district heating projects in the cities. The project pre-feasibility undertaken in San Pedro de la Paz showed that a district heating network using waste heat from a paper mill would be technically and economically feasible to supply heating and hot water to 5 residential buildings, 257 houses and two schools, with more than 2,000 users, saving 4.8 tons PM2.5/year and 48.39 ton CO_2/ year, the estimated IRR is 13%. In Temuco several potential projects have been identified , a small private pilot "Aguas Araucanía" is successfully running since 2015, the Municipality is also assessing the project of "German Becker" which would connect two high schools , a theatre and a public swimming pool reducing emissions by 95% for a total investment of US$ 700,000, and a city-wide district energy master planning is currently under development to design a short, medium and long-term strategy on district energy for the city. And in Coyhaique a project is being developed with support funds from the Regional Office of the Ministry of Environment in the area of Escuela Agrícola. This 8.1 MUSD project will be developed in two phases and will reduce health issues related to air pollution of 700 families. Additional assessments have been finalised in Santiago, Independencia, Recoleta and Renca, with the identification of potential projects on district cooling or heating and cooling. Another four cities including Puerto Williams, Hualpén, Coronel and Talcahuano are being assessed (Puerto Williams was funded by the Ministry of Energy. The other three cities were funded by the Ministry of Environment). The requests from local governments and building owners to receive support to perform pre-feasibility studies is growing fast.

The Ministries of Environment and Energy have been actively contributing to the work performed under the Initiative. With the contribution form the Chilean Economic Development Agency (CORFO), a methodology for the development of local heat maps is being prepared, and a user-friendly guide to encourage the development of district energy projects has been published. The Ministry of Environment has identified district heating as one of the key technologies to improve air quality, especially in the cities of the South, and has integrated the district heating into the country's Decontamination Plan. The Ministry of Energy has included district heating into its national energy strategies, including the Energy Policy 2050, the Policy on the use of Firewood and Derivatives for Heating, and the Energy Route 2018 - 2022 which sets the path to improve energy efficiency in the commercial, public and residential sector.

Although district energy is gaining recognition in Chile, translating this into projects and long-term market transformation will require a more ambitious and coordinated response from the national and local governments, industry and academia. The President Sebastian Piñera has included the development of a district energy pilot under the air quality strategy of his Presidential Plan, aiming at demonstrating the technology in Chile and helping initiate the market. Additionally, district heating has been included in the Chilean National Decontamination Plan.

The work performed under the District Energy in Cities Initiative has highly contributed to raise the interest on district energy by raising awareness among local authorities and private developers on the multiple benefits of district energy systems. While the Initiative is currently working with 12 cities in Chile, the number of requests from new municipalities to join and receive support for project development is growing fast. These requests for support have revealed the need to establish an institutional structure at national level to provide coordinated support and guidance to local governments and private developers on how to bring district energy projects to market.

The awareness raising activities that are being delivered in the country and the trainings underway are increasing the demand from the local authorities to join the Initiative and receive support to identify projects and develop pre-feasibility studies. At the same time, the cities that have been selected and that are currently receiving light-touch support from the Initiative are demanding for additional support to prepare procurement plans and commercialize the projects that are being assessed.

3) Proposed alternative scenario with a description of project components, outcomes, outputs and activities

The objective of this project is to accelerate the decarbonisation of the heating sector in Chile by fostering the deployment of district energy systems[8]. It will accelerate investment in high efficient and renewable district energy systems in Chilean cities addressing issues such as: GHG emissions and air pollution coming from inefficient heating systems; the utilization of waste heat as energy source for heating and cooling; the integration of higher rates of renewable energy (solar, geothermal, biomass) in the cities energy mix; and energy poverty understood as a lack of sufficient economic resources to afford thermal comfort.

Building on the work already underway in the country such as the activities undertaken under the District Energy in Cities Initiative with support from the Ministry of Energy and the Ministry of Environment that initially helped to identify potential bankable projects in so far 12 selected Chilean cities, the proposed project will bring up to three projects from the pre-feasibility to the tender stage. The cities will receive support to prepare a project procurement plan and develop a long-term district energy masterplan. These three cities will be selected by a National District Energy Office (NDEO). Hence, this project will unlock investment to build the first round of demonstration projects and kick-start the district energy market in Chile by: 1) establishing a NDEO to support local governments in the development and commercialization of projects; 2) developing and creating a National District Energy Financial Support Programme to overcome financial barriers and build the first round of demonstration pilot projects and test innovative business models, 3) designing an enabling regulatory framework at national and local level to reduce risk perception from the private sector for catalysing investment, and 4) raising awareness, building capacity and disseminating project results, best practices, methodologies and tools to scale-up the market. Figure 2 visualizes the process for selecting and developing the demonstration projects.

Component 1: Establishment of a National District Energy Office (NDEO)

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Expected Outcome 1: Municipalities and private developers plan, develop and promote district energy projects, with the support of the National District Energy Office (NDEO)

The goal of Component 1 is to establish a national institutional structure to coordinate, guide and support the emerging district energy market in Chile. This will be done by establishing a National District Energy Office (NDEO) consisting of two engineers at the Agency of Sustainability Energy in charge of providing technical support to support the

building of the capacity of local governments and private developers to develop and commercialize energy efficient and low-emission district energy projects. The NDEO will be supported during the project by UNEP and its District Energy in Cities Initiative.

Output 1.1. National District Energy Office established

As an initial step of the project the NDEO will be established by setting up the institutional structure to coordinate, guide and support the district energy market. The NDEO will be hosted by the Agency of Sustainability Energy (Agencia de Sostenibilidad Energética - ASE), currently in charge of implementing several programs set by the Ministry of Energy and will be supervised by the Ministry of Environment to ensure compliance with national environmental policies. It is expected that the NDEO will be financially sustained with own funds from the Agency of Sustainability Energy once this project finishes[9][9].

The project provides support so that the roles, procedures, responsibilities and management to constitute the NDEO are defined. The NDEO will consist of a technical team composed of one full time professional who will identify, prioritize, and make a pre-evaluation of DES projects, and two senior advisors who will receive prioritized projects and perform detailed evaluations (component 2). ASE will hire / designate staff and experts to start operation of the NDEO' technical team consisting of three professionals, two senior engineers - one to also perform as project manager (PM) - and one junior engineer.

In line with the crosscutting gender strategy of the project, women will be highly encouraged to apply for these three positions at the Agency. This will be reflected in the job opening description launched by the Agency to hire the two engineers.

Figure 1: Management of the National District Energy Office (NDEO)

The role of the NDEO will be to:

- Monitor and map every district energy project in Chile, creating a national geographic database and cross check projects with the priority areas identified in the Heat Map Chile.
- Set-up and launch a National District Energy Financial Support Programme where municipalities can apply for technical support. Including defining the structure, coordination procedures and launching a webpage and link of tools (see also Component 4).

- Co-create a methodology for managing the pipeline of projects, including prioritizing of projects, definition of level of involvement in project evaluation, definition of a guideline processes for local governments and private sector, among others.
- Co-develop tools, methodologies, standardized templates and trainings for local governments and the private sector focused on improving the project's economic feasibility.
- Co-evaluate three high potential pilot projects to be selected by the panel to receive financial support for project development and construction under Component 2.
- Co-develop training modules and deliver capacity building sessions to local stakeholders under Component 4.
- Monitor and evaluate the environmental and social impact and evolution of the district energy market in Chile. The gender aspects will be analysed as part of the social impact evaluation including an analysis of potential differences in behaviour of women and men towards the use/acceptance of connecting to a district energy network.
- Disseminate results and findings, organizing public events and seminars, in order to inform the market, and lower the perception of risks. In line the project's crosscutting gender strategy, dissemination and awareness raising activities will be gender sensitive and will be adapted or tailored to women needs if required.
- Propose three high potential pilot projects in collaboration with the Ministry of Energy and Ministry of Environment to be selected by the steering committee to receive financial support for project development and construction under component 2.
- Ensure that the district energy project that are replacing woodstoves (and old radiators) will follow the scrap protocol of the Woodstoves Change out Programme.[10][10]

During the project implementation period the NDEO will receive targeted technical support from UNEP through the District Energy in Cities Initiative. The technical support will comprise activities that help the NDEO to:

- Create a methodology for managing the pipeline of projects, including prioritizing of projects, definition of level of involvement in project evaluation, definition of a guideline processes for local governments and private sector, among others.
- Develop tools, methodologies, standardized templates and trainings for local governments and the private sector focused on improving the project's economic feasibility.
- Provide technical expert support and guidance to municipalities on procurement plan development and tendering processes.

- Provide technical support and tools on urban planning in order to create enabling conditions for future district energy projects.
- Provide guidance on funding mechanisms and financial instruments available in Chile to support the development of District Energy Projects.
- Develop training modules and deliver capacity building sessions to local stakeholders under Component 4.

Output 1.2. A national geographic database for district energy projects is created

Once established, the NDEO will, supported by UNEP's District Energy in Cities Initiative, initiate its work analysing and providing technical assistance to local governments and private developers on the first round of projects selected under an open call for project proposals. The NDEO will elaborate a database with all the district energy projects under development and cross check projects with the priority areas identified in the Heat Map Chile. UNEP will support the NDEO in generating the standardized methodologies, including the creation of a methodology for managing the pipeline of projects, including prioritizing of projects, definition of level of involvement in project evaluation, definition of a guideline processes for local governments and private sector, among others. The agency through the District Energy in Cities Initiative will use its network of champion cities to provide input on the methodologies, best practices or tools to enrich the methodologies that are developed for Chile. The developed data base and the National Heat Map Tool will be used for identifying particularly promising projects and municipalities.

Output 1.3. A methodological approach to support local governments and private developers is developed and published in an internal procedure guidebook

The District Energy in Cities Initiative has created a virtual platform that will support the project with tools, methodologies, trainings and best practices on global level (examples of which can be found in **Table 1**) and can be adapted to Chile. This platform also provides a communication link between learning cities and mentor partners of the initiative such as champion cities and private sector partners.

Table 1: Examples of global methodologies, tools and best practices developed/under-development by the District Energy in Cities Initiative

Global methodologies	· 10-step DES Action Modules for accelerating DES in cities · Global methodology for a DES rapid assessment of a city to understand DES potential and barriers · Steps to delivering a deep assessment of a city to determine a DES plan of future policies and projects · Process of demonstration project development · Establishing data collection for heating and cooling in a city
Global tools	· Decision tool for local and national policymakers to identify policy interventions · DES cost-benefit analysis tool · Software and support for establishing energy mapping in a city. · Guidance for an MRV Framework of District Energy Activities in Cities
Global best practice	· DES publication · Case studies of policy, finance and technology best practice in champion cities · Best practice national frameworks for promoting DES development in cities

Output 1.4. Up to 10 projects are reviewed and their financial feasibility is improved

Up to ten (10) projects will be selected to receive support and guidance from the NDEO, prioritizing those that are more advanced (pre-feasibility stage) and those with higher environmental benefits (e.g. energy efficiency, emissions reduction, use of renewable energy sources, etc.). Criteria for selection will be developed as part of the project and will include gender considerations. The selection criteria will consider and respect the safeguards established in UNEP's Environmental, Social and Economic Review Note (ESERN) for the project (see Annex P). Projects will be evaluated by the technical experts of the NDEO with support from the District Energy in Cities Initiative, and local governments and private developers will receive targeted technical assistance and guidance to improve the project's financial feasibility, address financial and regulatory barriers, design the business model and outline the procurement plan. Project sponsors (local governments or private developers) will receive a set of recommendations on how to progress from the pre-feasibility stage to commercialization, including recommendations on how to improve the project's profitability and funding opportunities.

Methodologies and tools to build capacity among local stakeholders will be developed to include a cost-benefit tool for project development. The tools will be shared with relevant stakeholders, including municipalities across Chile, through a set of three training workshops with support of the NDEO. These activities will result in increased number of municipalities with new action plans to develop district energy (Target: 5).

Outputs, activities and deliverables for Component 1:

Outputs	Activities
1.1 National District Energy Office (NDEO) established	1.1.1. Establish the institutional structure to coordinate, guide and support the district energy market. Define roles, procedures, responsibilities and management to constitute the NDEO.
	1.2.1. Hire / designate staff and experts to start operation of NDEO (technical team of three professionals, two senior engineers - one to also perform as PM - and one junior engineer)

Outputs	Activities
	Deliverable(s) for Output 1.1: *1. NDEO is established*
1.2 National geographical database for district energy projects created	1.2.1. Elaborate a database with all the district energy projects under development and cross check projects with the priority areas identified in the Heat Map Chile
	1.2.2. Create a methodology for managing the pipeline of projects, including prioritizing of projects, definition of level of involvement in project evaluation, definition of a guideline processes for local governments and private sector, among others
	1.2.3. Use database and the National Heat Map Tool for identifying particularly promising projects and municipalities
	Deliverable(s) for Output 1.2: *1. National geographic database for district energy projects is created*
1.3. A methodological approach to support local governments and private developers is prepared and published in an internal procedure guidebook	1.3.1. Prepare NDEO's general internal procedures for project selection
	1.3.2. Develop tools and methodologies, e.g. manuals, to establish a methodological approach to address the demands received from the cities/project proponents, and to have the tools ready to apply them to projects selected under 1.4
	1.3.3. Develop trainings, i.e. concept and material, for local governments and the private sector focused on improving the project's economic feasibility
	1.3.4. Develop and provide guidance on funding mechanisms and financial instruments available in Chile to support the development of district energy projects
	1.3.5. NDEO prepares terms of reference for an open call for project proposals and publishes it on the ASE/Ministries platform.
	Deliverable(s) for Output 1.3: *1. Tools, methodologies, and trainings for local governments and the private sector* *2. Methodological approach developed; internal Procedure Guidebook published* *3. Terms of reference for open project call*
1.4. Up to 10 projects are reviewed and their financial feasibility is improved	1.4.1. Select up to 10 projects in two tender rounds to receive support and guidance from the NDEO (advanced and higher environmental benefits preferred) from first round of projects under the open call for project proposals (using selection criteria developed under Activity 1.3.1)
	1.4.2. Technical assistance to local governments and private developers to develop a project action plan to improve the project's financial feasibility, address financial and regulatory barriers, design the business model and outline the procurement plan
	1.4.3. NDEO supports and guides project proponent on how to attract finance and in identification of adequate financial support mechanism for projects.

Outputs	Activities
	1.4.4. NDEO provides technical support and tools on urban planning in order to create enabling conditions for future district energy projects
	1.4.5. NDEO provides technical expert support and guidance to municipalities on outline and develop procurement plans and tendering processes
	1.4.6. Provide recommendations on how to progress from the pre-feasibility stage to commercialization, including recommendations on how to improve the project's profitability and funding opportunities.
	1.4.7. Organise stakeholder workshop with the 10 projects (project developer, municipalities, potential end users, etc.) to exchange experiences and lesson learnt (also as input for Component 3 on the regulatory framework)
	Deliverable(s) for Output 1.4: *1. Up to 10 projects are selected, reviewed and their financial feasibility is improved* *2. Stakeholder workshop to exchange experiences and lesson learnt*

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Component 2: Demonstration of financial feasibility of district energy projects

Expected Outcome 2**: **Chile has evidence from the successful tenders to review and calibrate its financial incentive schemes to include district energy

The aim of Component 2 is to support the construction of a set of exemplary district energy projects in Chile, demonstrating that affordable, reliable and low-carbon heat can be delivered with manageable levels of risk.

Figure 2: Process flow chart for the pilot project selection and support provision

With this purpose, the newly created National District Energy Financial Support Programme will focus on providing project development and capital support to build the first round of demonstrative projects in Chile. This experience will provide data on costs, regulatory barriers, business models, financing and benefits that will serve as inputs for the

development of an enabling national and local regulatory framework to be developed under Component 3, and to start the market of district energy in the country. The programme will be managed by the National District Energy Office, established under the Agency of Sustainability Energy and developed under Component 1, in coordination with the guidelines provided by the Ministry of Energy, the Ministry of Environment and UNEP.

Output 2.1. District Energy financial incentives are reviewed to be included in a proposal for the National District Energy Financial Support Programme

The NDEO with technical assistance from UNEP's District Energy for Cities Initiative will define the structure and coordination procedures of the National District Energy Financial Support Programme to set-up and launch the programme (Component 2). For identifying and promote most promising projects, the NDEO will develop selection criteria for high potential projects to be applied by an advisory panel composed by the NDEO, the Ministry of Energy, the Ministry of Environment and UNEP (reflecting criteria used under 1.2.2). From the ten projects, up to three (3) high potential projects will be selected to receive financial support from the National District Energy Financial Support Programme (under component 2) to go through detailed project development, tendering and construction. The selection will be made by an advisory panel composed by the NDEO, the Ministry of Energy, the Ministry of Environment and UNEP. The selection will be made following criteria such us: carbon emissions savings, PM2.5 savings, high priority areas for the National Air Decontamination Plan, project's profitability, energy source, compliance with safeguards according to UNEP's ESERN etc. Gender aspects such as the potential impact on women's health or customs as household managers will also be considered in the project selection criteria. The selection criteria will be defined by the selection panel. See figure 2 for a visualization of the process.

The National District Energy Financial Support Programme is intended to be implemented in coordination with other existing financing programmes, such as the Woodstoves Change out Program (implemented by the Ministry of Environment), and the Building's Thermal Retrofit Programme (implemented by the Ministry of Housing). Both programmes provide subsidies to improve energy efficiency in buildings and replace old inefficient woodstoves by cleaner systems. However, the allocation of resources does not consider so far, a prioritization of beneficiaries situated in high potential areas for district energy. Under this component the NDEO will work with the Ministry of Environment and the Ministry of Housing to review the selection criteria of the Woodstoves Change out Program and the Building's Thermal Retrofit Programme to integrate beneficiaries in high potential areas for district energy, reinforcing the support provided under the National District Energy Financial Support Programme and contributing to creating enabling conditions for the development and capitalization of district energy. The ultimate goal for this reallocation of funds coming from existing programmes is to integrate district energy into existing incentive schemes and ensure a sustained support to the technology after the completion of the GEF7 project.

Output 2.2. Detailed project development undertaken to bring up to 3 pilot projects from pre-feasibility to tender

The National District Energy Financial Support Programme will cover project development costs related to bringing to tender up to three pilot projects selected from the pre-feasibility stage. This may include detailed financial modelling, business modelling, detailed engineering design, customer contractual arrangements, legal costs related to developing customer commercial agreements, supply contract, tariff structures, land access arrangements, and tender documentation. The detailed studies of the pilot projects and the bidding rules will be carried out by independent experts. UNEP will support and review all the documentation generated.

Output 2.3. Calls for tender for the construction and operation of up to 3 pilot projects are launched and bidders selected

The NDEO will arrange a call for tender and publish tender documents for the three projects. In cooperation with the municipalities, bidders will be pre-selected for further consideration and a recommendation on the preferred bidder and subsequent selection will be provided to the municipalities.

Output 2.4. District energy master plan and investment roadmap developed with up to 3 cities with pilot projects selected to receive support from the National District Energy Financial Support Programme

Cities selected for the development of pilot projects will receive support to develop district energy policy (Master Plans) and investment roadmaps to ensure scale-up of DES within the city and the attainment of greater energy efficiency, GHG reductions and integration of renewables. This will include identification of:

1) The long-term technical and economic potential of DES (15-20 years), and corresponding investment levels, based on least cost analysis and ranking methodology according to best applicable technology, and availability of other heating/cooling sources such as renewables and waste heat, and other fuels;

2) The benefits at the local and national level of achieving this DES potential, including economic, environmental and social benefits and how this can fit into existing environmental and energy strategies in the city,

3) A long-term project, including identification of priority and opportunity zones for new district energy system development or expansion, new heat/cool sources, priority network investments (rehabilitation, substations, metering, etc.);

4) Long-term network design options, including network expansion, network rehabilitation, network interconnections, transmission lines and waste heat connections.

The National District Energy Financial Support Programme will provide targeted capital support for up to three pilot projects for: 1) retrofitting of buildings to improve energy efficiency or install the internal distribution network, 2) connection costs, and 3) network construction costs. This capital support (up to USD 1 million) is provided as ‘gap funding’ to kick-start the district energy market in Chile, overcome the barriers stated under section 1 and deliver a cost-effective alternative to the traditional woodstoves. This targeted capital support will be granted following a detailed evaluation from the NDEO and considering the results obtained from the detailed financial and business modelling. Projects receiving these grants will need to prove that the project could not go ahead without funding support from the National District Energy Financial Support Programme (e.g. the local government cannot raise the capital, and/or the project financials (i.e. internal rate of return), whilst positive, are not attractive enough to enable funding on the open market or through other available means alone. Replaced traditional woodstoves by the projects will be scrapped and recycled following the corresponding protocol of the Woodstoves Change out Programme[11][11].

Co-Funding from the Ministry of Housing channelled through the National District Energy Financial Support Programme is expected to amount to USD 15.0 million to leverage private sector investment. The main objective of this funding is to help drive down costs of the pilot district energy networks, build capacity in the country and get lessons learn from the construction and operation of the pilot projects, test innovative business models and technology applications and demonstrate to investors that district energy is a viable solution for Chile.

Outputs, activities and deliverables for Component 2:

2.1. District Energy financial incentives are reviewed to be included in a proposal for the National District Energy Financial Support Programme.	2.1.1. Review selection criteria of the Woodstoves Change out Programme and propose DES incentives to be included in their regulations
	2.1.2. Review selection criteria of the Building's Thermal Retrofit Programme and propose DES incentives to integrate beneficiaries in high potential areas for district energy
	2.1.3. Identify and review another mechanism to leverage co-finance and propose DES incentives in their regulations
	2.1.4. Define the structure and coordination mechanism of the National District Energy Financial Support Programme and propose the amendments of the existing programmes for incorporation of incentives for DES in the programme regulation (under 2.1.1-2.1.3)
	2.1.5. Validate with the national authorities the proposals of DES incentives to be included in a National District Energy Financial Support Programme proposal
	Deliverable(s) for Output 2.4: *1. Proposal of a National District Energy Financial Support Programme.*
2.2. Detailed project development undertaken to bring up to 3 pilot projects from pre-feasibility to tender	2.2.1. Propose up to 3 high potential pilot projects to be selected by the National DES Committee (composed of NDEO, Ministry of Energy, Ministry of Environment and UNEP) to receive financial support for project development and construction
	2.2.2. Cover project development costs related to bringing to tender up to three pilot projects selected from the pre-feasibility stage
	2.2.3. Technical and financial support to the three pilot projects to facilitate customer contractual arrangements, legal costs related to developing customer commercial agreements, supply contract, tariff structures, land access arrangements
	2.2.4. Development of project specific tender documentation: technical, legal and administrative Terms of Reference
	Deliverable(s) for Output 2.2: *1. Up to three high potential pilot projects are selected to receive support from the National District Energy Financial Support Programme* *2. Detailed project development undertaken to bring up to 3 pilot projects from pre-feasibility to tender* *3. Technical, legal and administrative Terms of Reference*
2.3. Calls for tender of the construction	2.3.1. Arrange call for tender and publish tender documents of the three projects

and operation of the 3 pilot projects are launched and bidders selected	2.3.2 Pre-select bidders for further consideration. Provide recommendation on preferred bidder and selection
	Deliverable(s) for Output 2.3*:* *1. Calls for tender for the construction and operation of up to 3 pilot projects are launched and bidders selected*
2.4 District energy master plan and investment roadmap developed with up to 3 cities with pilot projects selected to receive support from the National District Energy Financial Support Programme	2.4.1. Develop a master plan of district energy scale-up for each selected city (develop policy and technology roadmaps, interlinkage with Component 3)
	2.4.2 Support cities selected for the development of pilot projects to develop district energy investment roadmaps to ensure scale-up
	2.4.3 Provide targeted capital support to up to three pilot projects
	Deliverable(s) for Output 2.4*:* *1. District energy investment roadmap developed with up to 3 cities with pilot projects (i.e. three policy and technology roadmaps)* *2. Targeted capital support for up to three pilot projects granted* *3. Co-finance from the NDEFSP ready for Disbursement*

Component 3: Designing an enabling regulatory framework at national and local level

Expected Outcome 3**: **Private investor's risk perception on district energy is reduced by incorporating clear guidance on district energy into national and local regulatory frameworks.

The creation of a sustainable market for district energy in Chile requires the development of an enabling regulatory framework that sets up the rules for the construction and operation of heating and cooling networks. The lack of a regulatory framework for district energy increases the project's risks and has a deterrent effect on private investors and operators. The Ministries of Energy and the Ministry of Environment are aware of this barrier and are seeking support from the GEF to design national, regional and city-level policies and regulations to attract investment and enable the development of energy efficient district energy projects.

National, regional and city-level policies and regulations are required to remove barriers and accelerate investment in energy efficient, cost-competitive and high-quality district energy. Based on lessons learnt from the pilot demonstrations and international best practices, the project will consult-upon, design and implement such an enabling framework including the following:

Output 3.1. Technical and planning regulations and standards on district energy are developed and prepared for adoption, considering national and international experiences and good practices

The component will develop and prepare the technical and planning regulations and standards for district energy considering national and international experiences. This will be based on a deep analysis of existing national regulations to identify the areas where district energy could be incorporated (e.g. combined heat and power (CHP) regulations, building codes, construction standards for new development areas, heating tariffs, technical regulations for the construction of district energy plants and waste heat recovery from the industry) that has been conducted in 2019 (co-financed). Based on this analysis, technical and planning regulations and standards will be developed, considering national and international experiences, ready for adoption by the Government. The national regulatory framework for district energy will aim at both protecting customers from abusive tariffs and attracting private sector investment establishing clear and transparent rules for the private sector to develop and operate district energy networks. This will include:

- Technical regulations and interconnection standards.
- Regulations on the sale of heating (customer protection, tariff structures, etc.)
- Include district energy into building codes.

The development of the regulatory framework will be supported by UNEP' experts of the District Energy in Cities Initiative. In addition, international and local consultants specialised in energy policy and regulation will be contracted. UNEP will build on its experiences with best practices on regulations that provided good results in other markets and will evaluated its feasibility and integration in the Chilean. Additionally, the NDEO and the District Energy in Cities Initiative will provide recommendation for national strategies, NDC updates and international communication taking into account the potential impact from DES project in Chile in future.

Output 3.2. Guidelines for municipalities on how to incorporate the technical and planning regulations and standards of Output 3.1 into the local regulatory framework are developed

Local governments can effectively catalyse district energy deployment first and foremost in their role as planner and regulators. Local governments have an integral role in planning community-based energy solutions that can help meet specific targets and objectives. By adapting the local regulatory framework, local governments can encourage the development of district energy through target setting, integrated energy planning and mapping and local policies that encourage connection.

Under this component, based on a deep analysis of existing regulatory instruments at local level that has identified the areas where district energy could be incorporated and to adapt them where necessary (on-going and co-financed) the implementation of the national regulations is conducted at the commune level and the incorporation of district energy into the different Territorial Planning Instruments (Instrumentos de Ordenamiento Territorial). Based on this analysis, technical and planning regulations and standards will be developed and a guideline for Municipalities to incorporate these regulations into the local regulatory framework will be prepared and disseminated (Dissemination will take place under component 4). A guide summarizing technical and policy regulations will be prepared adapted to the needs of private developers, investors and operators.

Outputs, activities and deliverables for Component 3:

3.1. Technical and planning regulations and standards on district energy are developed and prepared for adoption, considering national and international experiences and good practices	3.1.1. Develop technical and planning regulations and standards for district energy considering national and international experiences, incl. technical regulations and interconnection standards, regulations on the sale of heating (customer protection, tariff structures, etc.), Include district energy into building codes.
	3.1.2 Provide recommendation for national strategies, NDC updates, international communication to incorporate consideration of DES
	Deliverable(s) for Output 3.1.*:* *1. National regulatory framework for district energy drafted, incl. Technical regulations and interconnection standards, Regulations on the sale of heating (customer protection, tariff structures, etc.), Include district energy into building codes.*
3.2. Guidelines for municipalities on how to incorporate the technical and planning regulations and standards of output 3.1 into the local regulatory framework are developed	3.2.1. Analyse existing regulatory instruments at local level to identify the areas where district energy could be incorporated
	3.2.2. Draft adaptation of regulatory framework where necessary to facilitate the implementation of the national regulations developed under component 3.1 at the commune level and the incorporation of district energy into the local urban development plans (Instrumentos de Ordenamiento Territorial)
	3.2.3. Prepare a guideline for municipalities to incorporate these regulations into the local regulatory framework (dissemination will take place under component 4)
	Deliverable(s) for Output 3.2.*:* *1. Guideline for municipalities on how to incorporate the technical and planning regulations and standards*

Component 4: Outreach, trainings and dissemination of results to scale-up the market

***Expected Outcome 4**: Municipalities and the private sector have the knowledge and capacity to plan, develop and commercialize district energy projects.*

This component will focus on scaling up results by collecting and disseminating best practices and results of activities implemented under components 1 to 3 and building capacity and knowledge through the development of guidelines and delivery of trainings tailored to the needs of each stakeholder (local governments, building developers, investors and operators).

Output 4.1. Methodologies and tools to build capacity among local stakeholder on project development, including a cost-benefit tool are developed and delivered

This component will include the development of a step by step guide tailored to local governments to inform them and guide them through the commercialization process of a district energy project and including existing funding opportunities such as the capital support programme, how to engage public consumers and the steps to bring a project to tender.

Further to these guidelines, a training package including training sessions tailored to the needs of each stakeholder (local governments, building developers, investors and operators) will be delivered. The training sessions will include: 1) Funding mechanisms and financial instruments available in Chile to support the development of District Energy Projects, 2) Best practices on how to engage end-users ; 3) The tendering process of a district energy project step by step, funding support to develop tender material and a procurement plan; 4) Waste heat recovery for district heating, geothermal and solar energy for district heating in Chile; The training sessions will count with the presence of international experts and the support of the District Energy in Cities Initiative. UNEP and the District Energy in Cities Initiative will support and develop training material for the trainings. This will also include the design of documents, flyers, etc. and the organisation of events, agendas, invite international experts etc.

UNEP and the NDEO will prepare technical summaries (fact sheets) with lessons learnt and main technical and economic characteristics of up to three pilot projects for dissemination and to attract the attention of private investors.

The project will prepare an informative guide for private developers, investors and operators on adopted technical and planning regulations and minimum standards for design, installation and operation of schemes and will deliver the information through a training session. The NDEO will prepare the guide summarizing the technical and policy regulations adapted. The guide will also inform and used for the awareness raising workshops delivered under Output 4.2.

Output 4.2. Outreach campaign and awareness raising material is designed and disseminated to the stakeholders

Outreach and awareness raising material tailored to each stakeholder will be prepared, this will include: 1) user-friendly guide for end users explaining the benefits of district energy and the process of connecting a building to a district energy network, differences in the use of heating devices by gender will be considered in the drafting of the user's guides and if required specific user's guide and outreach events will be organised for women to address their concerns and receive their feedback on how district heating can be better accepted by the communities 2) informative guide for building developers on technologies available for district energy and the importance of combining energy efficiency in buildings with district energy in new development areas, 3) brochure including main technical and economic characteristics of the pilot projects supported under component 2. The results of these activities are to lead to leveraging additional district energy project requests to the NDEO (Target: 5).

Further as part of the outreach and dissemination component, at least two awareness raising workshop and six webinars will be organized through the project implementation period to reach new cities, share international best practices, transfer knowledge and help disseminate the methodologies and tools developed under component 1 to 4. UNEP and the District Energy in Cities Initiative will support the preparation of the webinars and provided technical infrastructure (webinar online tool).

A website on District Energy will be developed and hosted by the Agency of Sustainability Energy website with links to the Ministry of Energy and the Ministry of Environment (co-financed). The development of the website (with external IT / design support) is arrange by the Agency of Sustainability Energy. UNEP will support in generating content or giving ideas in the design. This website will be used to communicate on the establishment of the National District Energy Office and explain the functions and services that will be provided by this unit. It will include the main technical and economic characteristics of the demonstration projects, basic information on the projects under development stage and information on available funding opportunities to support project development, such as the capital support programme developed under component 2, and a "project market place" for matchmaking between developers, investors, ESCOs and public entities. The website will be used to disseminate the new methodologies, tools and training material developed under components 1 to 4 as well as existing tools and materials developed such as the local heat map tool, the rapid assessment methodology, etc.

The project will involve women's and indigenous people's NGOs such as the *"Regional Observatory for Gender and Ethnical equality"* or "*Originaria*" in the development of dissemination and awareness raising activities and material to get their feedback and address their concerns.

Outputs, activities and deliverables for Component 4:

4.1. Methodologies and tools to build capacity among local stakeholder on project development, including a cost-	4.1.1. Develop a cost-benefit tool for project development
	4.1.2. Disseminate results and findings, organizing public events and seminars, in order to inform the market, and lower the perception of risks.

benefit tool are developed and delivered through	4.1.3. NDEO develops training modules and deliver capacity building sessions to local stakeholders. Provide a set of 3 training workshops to relevant stakeholders, including municipalities across Chile.
	4.1.4. Produce and disseminate research and communications materials documenting results and lessons learned from the projects supported under Component 2
	4.1.5. Prepare brochure including main technical and economic characteristics of the pilot projects supported under Component 2
	4.1.6. Prepare a guide summarizing technical and policy regulations adapted to the needs of private developers, investors and operators, including barriers overcome
	Deliverable(s) for Output 4.1.: *1. Cost-benefit tool* *2. Dissemination material, incl. informative guide for private developers, investors and operators summarizing technical and policy regulations framework for the private sector* *3. Fact sheets with lessons learnt and main technical and economic characteristics of up to three pilots developed and disseminated* *4. Three workshops and training sessions held*
4.2. Outreach campaign and awareness raising material is designed and disseminated to the stakeholders	4.2.1. Develop a step by step guide tailored to local governments to inform them and guide them through the commercialization process of a district energy project and including existing funding opportunities, how to engage public consumers and the steps to bring a project to tender
	4.2.2. Produce a gender sensitive user-friendly guide for end users explaining the benefits of district energy and the process of connecting a building to a district energy network
	4.2.3. Develop a guide for building developers on technologies available for district energy and the importance of combining energy efficiency in buildings with district energy in new development areas
	4.2.4. Provide training sessions tailored to the needs of each stakeholder (local governments, building developers, investors and operators) on 1) Funding mechanisms and financial instruments, 2) Best practices on how to engage end-users, 3) The tendering process, 4) Waste heat recovery for district heating, geothermal and solar energy for district heating in Chile
	4.2.5. Hold two awareness raising multi-stakeholder workshops
	4.2.6. Develop and hold six webinars (one every 2-3 months) to provide real life work and experience from cities and partners implementing policies in the menu of policy actions
	4.2.7. Develop website content on district energy

	4.2.8. Develop a website on District Energy and host it by the Agency of Sustainability Energy, with best practices, outreach material, methodologies, guidelines and training material uploaded and translated in Spanish
	Deliverable(s) for Output 4.2.*:* *1. Outreach campaign and awareness raising material is designed and disseminated to the stakeholders* *2. Two awareness raising multi-stakeholder workshops* *3. Six webinars* *4. Website on district energy hosted by the Agency of Sustainability Energy developed and online (in English and Spanish) (co-financed)*

4) Alignment with GEF Focal Area and/or Impact Program strategies

This project is aligned with GEF-7 Climate Change Focal Area covering the three fundamental objectives described under its strategy: CCM 1-3 - Promote innovation and technology transfer for sustainable energy breakthroughs for accelerating energy efficiency adoption: this will be achieved by accelerating the uptake of district energy networks in Chile and transferring international best practices to local stakeholders through the support of the District Energy in Cities Initiative.

Aligned with GEF-7 Climate Change strategy, this program specifically contributes to supporting Chile to make a transformational shift of its heating sector towards low-emission and climate-resilient pathways taking into consideration the following GEF objective: Accelerating energy efficiency adoption under *Objective 1. Promote innovation and technology transfer for sustainable energy breakthroughs* (paragraph 126 of the GEF PROGRAMMING DIRECTIONS[12]).

5) Incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and co-financing

District energy systems are more energy efficient than building level or apartment level individual heating. The scale of district energy allows for co-generation or tri-generation which raises the efficiency of district energy over these other systems. However, due to the piping and district infrastructure of district energy networks, district energy projects have high upfront costs, with long payback periods. Cities interested in district energy need to create the conditions for investment, including access to city energy demand data, evidence-based energy savings, financial estimates of potential projects, policy recommendations based on bottom-up, multi-stakeholder analysis, city wide district energy plans

and pre-investment support among other incentives to encourage investment. The project aims to support the municipalities to create these conditions and build the first round of demonstration projects to kick-start the market in the country. The GEF will finance costs to support to cities create these conditions and remove barriers to investment and is therefore incremental.

As mentioned in section 1), one of the main barriers to the broad scale-up of DES are high-financial costs. Projects activities are not economically viable in many cases when the energy density (i.e. residential areas) is low, due to high energy delivery costs during operation. Studies show that attractive IRRs of more than 15% can be achieved in dense areas which contain commercial buildings, hospitals, etc, which means that such projects are financially sustainable and attractive investments. However, integrating residential buildings in less dense areas into DES results in less attractive IRRs for private investors. They thus need incentives to connect these areas. Furthermore, residential customers currently use high polluting, but cheap, woodstoves and biomass. So, while their inclusion will benefit the environment and human health, it will likely reduce the investors financial return.

The project and its financial support shall help to overcome these costs and incentivise an integral, systematic approach for district energy projects. Its additional cost reasoning is that it may support project investors covering different areas (residential, commercial etc.) to develop projects that may achieve a reasonable return (i.e. average of different less and more attractive projects across a city connected to a system).

Figure 3: District heating investment costs based on Heat Roadmap Europe numbers

Source: Aalborg University, Heat Map Chile, 2019 (expected)

Note: Includes costs of distribution pipes

Furthermore, the GEF7 STAR allocation funding is required to go one step further in the work performed under the District Energy in Cities Initiative to initiate a market on district energy in Chile. The fund will be used to support local governments, already interested in district energy, to bring their projects from the early stages of project development to tender. This funding will also be used to establish the national coordination structures and set of regulations required to unlock investment to build the first round of demonstrative projects. The implementation of the GEF6 funded global District Energy in Cities Initiative has created momentum and has identified a pipeline of potential demonstration projects. This GEF funding will be used to bring all these projects to the market, initiating the first district heating market in Latin America. By building such momentum, combined with regulatory incentives, a transformation to sustainable, low-emission and energy efficient district energy can be achieved in Chile.

6) Global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF)

Modern district energy systems combine district heating and/or cooling networks with elements such as combined heat and power, thermal storage, heat pumps and/or decentralized /renewable energy to optimize efficiency and local energy resources use. By cooling/heating several buildings in a district/area of a city, district energy systems provide the economies of scale required to integrate large scale sources of heat and cool that cannot be connected on the scale of one building such as waste heat from industry or power stations; solar thermal; heat from groundwater and sewage; and free cooling from lakes, rivers or seas. Furthermore, District Energy allows integration and balancing of high shares of variable renewable power and renewable heating and cooling – particularly through relatively inexpensive thermal storage (but also Combined Heat and Power) Through these integrated approaches, cities worldwide in all regions are using modern district energy to reduce energy consumption for heating and cooling of urban buildings by 30 - 50% and to achieve ambitious renewable energy and CO_2 targets.

Heat accounts for around 75% of the total energy demand energy usage. Meeting legally binding climate change targets will require the complete or near-complete decarbonisation of heat. Heat networks have the potential to play a key role in the long-term decarbonisation of heating as they distribute heat from a central source to a range of customers and so are able to utilise the cheapest forms of low carbon heat that are available locally. In the future, networks can be progressively decarbonised with the most cost-effective solutions available to the market.

Estimated direct CO_2 emissions due to wood burning for heating is approximately 1.1 million tCO_2 annually for cities in the centre and south of Chile. Additionally, CO_2 emissions related to water heating can be over 500,000 tCO_2 in the same study area. In total, direct CO_2 emissions from these sources account for around 1.5 million tCO_2/year. According to the national CO_2 inventory (2010) in Chile, the commercial, public and residential sector accounts for 6.9 million tCO_2/year in total, so firewood heating and hot water production, only in the southern cities, consist of approximately 21% of total CO_2 emissions of this sector.

Direct and indirect emission reduction potential:

Estimates of the greenhouse gas emissions mitigation benefits of the project have been prepared using the “Guidance for an MRV Framework of District Energy Activities in Cities”, Version 1.0 and the “Calculating Greenhouse Gas Benefits of the Global Environment Facility Energy Efficiency Projects” and the related calculation tool, Version 1.0.

Component 2 contributes to direct GHG emission reductions, i.e. emission savings due to district energy projects that are commissioned due to the project implementation. Calculations have been made using the GEF methodology for Demonstration and Diffusion projects as per Textbox 2 below.

Textbox 2: Estimation of emission reduction potential

Pilot project descripton:

Figure 4: Map of Chile (Source: CIA World Factbook

Temuco is the capital of the Cautín Province and of the Araucanía Region in southern Chile south of Santiago. The city lies at the border of Chile's central valley Mediterranean region, albeit with an oceanic climate. Its mean annual temperature is approximately 13 °C, with highest median during summer of 23.5 °C and lowest median of 3.5 °C during the coldest months. Given that burning wood is the primary source of heat during the cold months in Temuco, air pollution is a recurrent problem during autumn and winter. As a consequence, air quality in Temuco is one of the lowest in Chile.

Temuco has about 260,000 inhabitants and about 90,000 buildings, of which approximately 70,000 are residential and 20,000 non-residential type. The pilot project has 26 public (18,900 m2 heated area) and 135 residential one-family buildings (177,896 m2 heated area). The typical occupation rate per one-family building is three people. The project will be in a mixed area of the city (residential and public buildings), so the estimation is representative also for other cities and can be replicated.

For the energy supply of the area a combined heat and power plant with an installed capacity of 14.4 MWel is necessary (12 MWel biomass and 2.4 MWel gas). The expected heat energy production per year amount to 24,365 MWhth from biomass and 4,942 MWhth from gas (total 29,307 MWh Heat). The gas boiler efficiency will reach 95 %, while the biomass boiler with economiser will achieve 106% efficiency. Heat energy losses in the district heating network are assumed to be 10%.

Today, most air pollution stem from the residential one-family house sector, in which the premises are heated primarily by individual wood stoves. The combustion in these devices is very inefficient and reached only 40-60% efficiency. In addition, efficiency is low due to the fact that very humid wood straight from the forest is burned, which also increases the amount of formaldehydes and other inhouse pollutions etc. There is limited data on the current wood consumption in the entire city. However, it is assumed that for the entire city of Temuco an installed power capacity of 1,800 MWth may be necessary for district heating supply.

Project scenario: Replacement of inefficient and polluting individual biomass wood stoves and gas boilers in various buildings including households, commercial buildings, government institutions through development of a 14.4 MWth district heat network run on biomass CHP (producing 2 MW of electrical power). Based on baseline analysis significant potential for biomass-based district heating systems exists in numerous cities in the south of Chile.

Baseline scenario: The current situation would prevail to exist, i.e. inefficient and polluting individual biomass stoves and gas boilers are continuously used. It has been assumed that 80% of households use firewood for heating, while the rest use LPG (most conservative, not considering residual oil boilers).

Direct emission reduction potential: Direct GHG emission reductions in the pilot project will be achieved through reduced use of firewood in inefficient stoves and replaced LPG boilers, through heat produced by a biomass CHP plant feeding the district heating network. The implementation of the pilot project in Temuco will result in an estimated emission reduction of approximately 13,000 tCO2/a and amount to 130,000 tCO2 accumulated over a period of 10 years after project implementation. The direct emission reduction potential in up to three cities in Chile supported under the project will thus achieve direct GHG emission reductions amounting to 39,000 tCO2/a; accumulated up to 390,000 tCO2 over 10 years and 780,000 tCO2 over 20 years can be mitigated.

Figure 5: Baseline and potential emission reduction from three pilot projects

Direct GHG emission savings have been calculated as the cumulative emission reductions of three demonstration projects resulting from the tender processes launched under output 2.2 and commissioned on 1 year after project completion. Further six projects (two per city) resulting from the adoption of long-term investment roadmaps by 3 cities as under output 2.4 can contribute indirect emission reductions. It is assumed that the projects resulting from the tender will be commissioned on the first year after project completion, whilst the two projects resulting from the investment roadmap will be commissioned respectively 6 years and 10 years after project completion.

The project results in an estimated "Direct GHG emissions savings" of 390,000 tCO_2 accumulated over 10 years and 780,000 tCO_2 over 20 years. Annex M describes the methodology used in the calculations in details.

It has been estimated that the work performed under component 1, 3 and 4 will result in the future construction of at least 10 additional projects with similar impact that will result in additional indirect emission reductions (see table below). According to the results of the Heat Roadmap Chile, which is developed in 2019 by the Aalborg University funded by UNEP, in support of the UNEP District Energy in Cities project, the market potential for district heating in Chile is 40% (in a conservative scenario) and can go up to 60%. PM 2.5 emissions reductions could reach to 40%, 13% overall reduction of primary energy consumption and 20% lower CO_2.

Table 2: Estimated emission reduction potential

Emissions reduction potential	**Annual emission reduction in tCO_2eq/a**	**Cumulated emission reductions over 20 years in tCO_2eq**
Direct emission (from up to 3 pilot projects)	39,000	780,000
Indirect emission (bottom-up) from 10 projects[13][13]	260,000	2,600,000

The project has a significant potential for reduction of short-lived climate pollutants emissions, i.e. the reduction of black carbon.

Note: The cities of the south of Chile share the geographic and atmospheric conditions and the demographic and incomes structure are very similar in the main cities thus the numbers are maintained for all three projects.

The standardization of district energy project development and commercialization and the demonstration effect will help the country reach its district heating potential and benefit from the emissions savings that this would entail.

7) Innovativeness, sustainability and potential for scaling up

The project features innovation in applying a 'systems approach' in energy planning, governance, business model development and technology applications through modern district energy systems. District energy creates synergies between the production and supply of heating, cooling, domestic hot water and electricity and can be integrated with municipal systems such as waste, wastewater, transport, public buildings and industry.

Innovation: District Energy is an unknown technology in Latin America. There are very few examples of implementation in the whole continent, Colombia has built a pilot on district cooling in Medellin, Chile has a very small private pilot with diesel in Temuco, and Argentina also has a couple of very small examples of district heating using geothermal energy. The project features innovation in bringing to Latin America a proven technology that is being implemented by leading cities on sustainability and the energy transition around the world. On a technical level, the project features innovation in its definition of modern district energy as "heat and cool networks that combine many technologies and approaches, such as combined heat and power (CHP), thermal storage, heat pumps and decentralized energy, to supply affordable and climate resilient (i.e. low carbon and energy efficient) heating and cooling services." Such integrated technology applications are new and this project will contribute to demonstrating these different applications in Chile, provide new data after implementation of the projects (e.g. on the multiple benefits of these approaches) and innovations (e.g. the use of new sources of low-grade waste heat for district heating and cooling).

Sustainability: The National District Energy Financial Support Programme is intended to be a sustainable mechanism that can evolve into a revolving fund in the future. Supported projects that are successfully running could pay back the project development costs covered by the National District Energy Financial Support Programme to replenish funds available under the Programme. The sustainability of the NDEO after the project will be guaranteed by the Sustainability Agency and the Ministry of Energy. As described under Component 2, the NDEO will work with the Ministries and the private sector to integrate district energy into existing incentive's schemes with the ultimate goal of ensuring a sustained support to the technology even after the completion of the GEF7 project and until the market is able to advance without any further support.

Potential for scaling up: The policy, coordination, regulatory work and replicability will be achieved under Component 1 "Establishment of a National District Energy Office (NDEO)", Component 3 "Designing an enabling regulatory framework at national and local level" and Component 4 "Outreach, trainings and dissemination of results to scale-up the market", leading to sustainability by setting-up the national coordination structures and rules that allow a market to operate and scale. The National District Energy Financial Support Programme (Component 2) is a mechanism inspired by UK's Heat Networks Delivery Unit, created by the government of UK to accelerate the deployment of district energy systems by encouraging and enabling local authorities to undertake the development stages of district energy networks, and with that unlocking investment on district energy projects. From the project and the NDEFSP other cities in Chile, beyond the pilot cities and the cities already identified, will be encouraged to investigate and develop their district energy strategies. Similar, as Chile is adopting the UK model the proven success through the project, could inspire other countries and cities in Latin America, such Argentina, in following the same approach. Argentina has already joined the District Energy in Cities Initiative.

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[2] UNDP NDC Support Programme, Chile: https://www.ndcs.undp.org/content/dam/LECB/docs/factsheets/Chile.pdf

[3] https://www.ndcs.undp.org/content/dam/LECB/docs/pubs-reports/undp-lecb-cpp-chile-action-plan-for-climate-change-spanish-2017-0824.pdf

[4] About the initiative: 42 organizations, including industry associations, manufacturers, utilities, financiers, non-government groups, as well as 45 champion cities across the world have partnered with the District Energy in Cities Initiative to support local and national governments implement district energy policies, programs and project pipelines that will accelerate investment in modern – low-carbon and climate resilient – district energy systems. The Initiative is currently working with 14 countries in district heating and cooling - including Serbia, Bosnia and Herzegovina, Chile, China, India, Malaysia, Mongolia, Morocco, Russia, Colombia, Seychelles, Tunisia, Argentina and Egypt– and 25 pilot cities, each of which have committed to implement at least one policy, to pursue one demonstration project, and to track their progress. India, Malaysia and Chile are currently developing GEF-7 proposals to deepen the work initiated under GEF-6 and achieve higher impact in their countries.

[5] National Action Plan on Climate Change 2017-2022, Table MM26, p. 128

[6] National Action Plan on Climate Change 2017-2022, Table AME7, p. 205

[7] The use of sustainable biomass will be guaranteed through the two main certification systems already in place in the Chilean forestry sector that regulate most of the forest activity: PEFC certification (Programme for the Endorsement of Forest Certifications Schemes), which has its national counterpart, CERTFOR, and FSC (Forest Stewardship Council). Furthermore, Chile is a REDD+ country and is part of the Forest Carbon Partnership Facility (FCPF). Under this framework the National Forestry Corporation (CONAF), is developing a Forests and Climate Change National Strategy to guarantee the sustainable use of forestry resources.

[8] District energy systems provide heating, cooling, and domestic hot water to buildings in a neighbourhood through a network of insulated pipes to replace standalone conventional sources of heating, cooling and hot water technologies. Such systems create synergies between the production and supply of heat, cooling, domestic hot water and electricity and can be integrated with municipal systems such as power, sanitation, sewage treatment, transport and waste. District energy networks are considered by many cities around the world as a key technology to maximise the use of local energy sources, integrate higher rates of renewable energy and improve energy efficiency.

[9] Every year the different institutions of the government of Chile elaborate the institutional budget for the next year. The Ministry of Energy envisages to integrate the NDEO budget item to run the office in their financial planning once the GEF7 project ends. Each year the budget will need to be requested.

[10] The scrap protocol consists of taking the woodstoves to a warehouse (temporarily) until the end of the replacement season. There, the Ministry of the Environment takes photos to ensure the exchange was made, and then the old woodstoves are transferred for smelting and recovery through metal recycling. The company that does the foundry work is AZA (http://www.gerdau.cl/acero/).

[11] The Woodstoves Change out Program has a scrap protocol tob e followed by the company that installs the new heaters, which is applied under the Atmospheric Decontamination Plan (PDA), except for the Metropolitan Region, because in Santiago the use of woodstoves is prohibited, and emission reductions are managed through a Compensation Program.

[12] GEF-7 REPLENISHMENT PROGRAMMING DIRECTIONS (PREPARED BY THE SECRETARIAT): https://www.thegef.org/sites/default/files/council-meeting-documents/GEF-7%20Programming%20Directions%20-%20GEF_R.7_19.pdf

[13] It is expected that additional 10 projects of the similar size and type will be implemented in the cities as a result of the adoption of the city-wide Master Plans, respectively commissioned within 5 to 10 after the project completion. These projects will contribute to indirect GHG emission reduction of 1.3 million tCO_2eq in total over the 10 years and up to 2.6 million tCO_2eq over 20 years following project completion

1b. Project Map and Coordinates

Please provide geo-referenced information and map where the project interventions will take place.

Figure 6: Area of Project implementation in Chile

Chile is a Republic in which the political-administrative framework is structured in three territorial levels of governance: administrative regions (16), provinces (54) and municipalities or communes (346).

The project is focused on the central and southern regions of Chile, from Región Metropolitana to Región de Magallanes y Antártica Chilena. Heating demand in Chile increases from North to South.

The work already performed by the District Energy in Cities Initiative in Chile has supported 12 cities in the Región Metropolitana, Región del Bío Bío, Región de la Araucanía y Region de Aysén del Gral. Ibañez del Campo and 4 cities in the process of being replication. The coordinates of the projects currently evaluated under the District Energy Initiative in cities are:

Table 3: Supported cities in Chile

City	Region	Latitude	Longitude
Renca	Región Metropolitana	-33.340.636	-70.727.997
Santiago	Región Metropolitana	-33.344.889	-70.669.265
Recoleta	Región Metropolitana	-33.397.207	-70.642.815
Independencia	Región Metropolitana	-33.413.347	-70.666.291
Talcahuano	Región del Bío Bío	-36.724.783	-73.116.981
Hualpen	Región del Bío Bío	-36.786.676	-73.109.953
San Pedro de la Paz	Región del Bío Bío	-36.830.535	-73.116.737
Coronel	Región del Bío Bío	-37.034.077	-73.140.484
Temuco	Región de la Araucanía	-38.735.902	-72.590.374
Coyhaique	Región de Aysén	-45.571.225	-72.068.265

It is expected that up to 10 cities will apply for support to the NDEO under Component 1 and will therefore be eligible to receive financial support from the National District Energy Financial Support Programme.

The assessments performed in the cities of Temuco, Coyhaique and San Pedro de la Paz revealed the potential of district heating as sustainable heating alternative to improve air quality and identified commercially viable potential district heating projects in the cities. Additional assessments have been finalised in another eight cities: Santiago, Recoleta, Independencia, Renca, Hualpén, Coronel, Talcahuano and Puerto Williams and additional replication cities are also requesting support to assess district energy potential. Further to this, private developers have undertaken pre-feasibility studies in the regions of Bío Bío, Los Ríos and Aysén. These projects are being evaluated by decision makers and may also be eligible to receive support from the National District Energy Financial Programme.

Capacity building and awareness raising activities included under Component 4 will target cities from Región Metropolitana to Región de Magallanes y Antártica Chilena.

1c. Child Project?

If this is a child project under a program, describe how the components contribute to the overall program impact.

This is not a child project.

2. Stakeholders

Select the stakeholders that have participated in consultations during the project identification phase:

Civil Society Organizations Yes

Indigenous Peoples and Local Communities

Private Sector Entities Yes

If none of the above,please explain why:

Please provide the Stakeholder Engagement Plan or equivalent assessment.

Please refer to the report: “Summary of stakeholder consultation meetings and validation workshop”, for information on the engagement of stakeholders during the development of the CEO Endorsement document and associated annexes.

Table 4 below describes the implementing partners and their anticipated activities, content and expertise that will be leveraged for the project and the areas of activity that these partners currently plan to support.

Table 4: Participation of stakeholders

Stakeholder main group	Stakeholder name	Existing activities with potential to be leveraged	Content engagement, contributions to the project (identified by Component)
Government and National Agencies	Ministry of Energy	The Ministry of Energy with the support of UNEP and the Aalborg University is developing a Chile heat map and heating roadmap on District Heating. The roadmap will provide a national framework all along the process of development and implementation of district heating in the country, capable of enabling the definition of specific national lines of action agreed by the main stakeholders. The draft national district heating roadmap supposed to be ready mid-2019. The District Energy in Cities Initiative is co-developer of this roadmap, which could become a national strategy. The Ministry of Energy supported by the Initiative has already implemented preparatory work within municipalities and cities so that these cities are ready to apply for further support through the NDEO.	The Ministry of Energy will be part of the selection panel of the National District Energy Financial Support Programme and will supervise and provide guidance to the project execution. Its contribution will be key for the implementation of the project, in particular for the establishment of the NDEO and the National District Energy Financial Support Programme und Component 1 and 2 as well as for the development of the national regulatory framework for district energy to be developed under Component 3.
	Ministry of Environment	Ministry of Environment offers the Woodstoves Change out Programme to replace old wood stoves. The Ministry is looking for a long-term sustainable heating solution. District heating had already been identified as a feasible solution and since 2012 the Ministry of Environment together with the Ministry of Energy had been financing several pre-feasibility studies.	The Ministry of Environment manages the woodstoves exchange programme. Financial support provided under this programme will be coordinated with the support provided under the National District Energy Financial Support Programme aiming at reinforcing the support provided to the deployment of district energy. The Ministry of Environment will be part of the selection panel of the National District Energy Financial Support Programme and will supervise and provide guidance to the project execution.
	Ministry of Housing	The Ministry of Housing is running a national programme to support thermal retrofitting of buildings (Building's Thermal Retrofit Programme)	The Ministry of Housing manages the national programme to support thermal retrofitting of buildings. Part of the funds available for this programme will be reallocated as co-finance to support improving efficiency of buildings in high priority areas for district energy.

Stakeholder main group	Stakeholder name	Existing activities with potential to be leveraged	Content engagement, contributions to the project (identified by Component)
	Agency of Sustainability Energy (Agencia de Sostenibilidad Energética)	The Agency of Sustainability Energy currently is in charge of implementing several programmes set by the Ministry of Energy, such the Public Lighting Program, the Energy Efficiency Program in Public Buildings and Hospitals, the Public Solar Roofs Program, the Development of Measures and Energy Efficiency Projects Programme. The Agency, together with the Ministry of Energy, is promoting the Comuna Energética Program, which is a platform for local action that seeks to promote sustainable and resilient energy development to climate change in the communes of Chile. Comuna Energética supports municipalities in developing Local Energy Strategies, with communal energy visions and action plans devised from the community.	The Agency of Sustainability Energy is a non-for-profit agency with the mission of promoting, strengthening and consolidating the use of efficient and sustainable energy. As Executing Agency for the project, it will host the NDEO and will manage the National District Energy Financial Support Programme. In addition, it will be leading the outreach and dissemination activities together with UNEP and supported by the implementing partners.
	Corporación de Fomento de la Producción de Chile (CORFO)	Production Development Corporation (CORFO) (full name in Spanish: Corporación de Fomento de la Producción de Chile) is the Chilean economic development agency that works to improve the competitiveness and the productive diversification of the country by encouraging investment, innovation and entrepreneurship. CORFO also foster the development of advanced human capital and technological capabilities to achieve a sustainable and territorially balanced economic growth. CORFO funded the development of two tools for improve the knowledge and help to overcoming the market barriers in district heating in Chile. A Handbook of district energy project development published by the Ministry of Energy and the develop of 11 heat maps of the main cities of the south of Chile.	CORFO has a variety of programs as guarantees and grants, for domestic and foreign companies that operate in Chile. These programs could be helpful for entrepreneurs, to innovate, to improve the productivity of a business or to invest in district energy projects.

Stakeholder main group	Stakeholder name	Existing activities with potential to be leveraged	Content engagement, contributions to the project (identified by Component)
Local authorities	Regional governments and municipalities, and the Chilean Association of Municipalities (ACHM)	Municipality and city-level policies and regulations for district energy are not existing yet commonly in Chile but are required to remove barriers and accelerate investment in energy efficient, cost-competitive and high-quality district energy. The work performed and experiences in 12 cities in Chile by the District Energy in Cities Initiative will be leveraged in particular to contribute to the local adaption of the regulatory framework. In addition, it will also be explored the possibility to leverage the work of the Chilean Association of Municipalities (ACHM), including through its technical commission on transport and public works.	Local governments can effectively catalyse district energy deployment first and foremost in their role as planner and regulators. Local governments have an integral role in planning community-based energy solutions that can help meet specific targets and objectives. By adapting the local regulatory framework, local governments can encourage the development of district energy through target setting, integrated energy planning and mapping and local policies that encourage connection.
Intergovernmental Organisations	United Nations Environment Programme (UNEP)	UNEP coordinates the District Energy in Cities Initiative, a multi-stakeholder partnership, with financial support from DANIDA, the Global Environment Facility, Italian Ministry of Environment and Protection of Land and Sea, and the Kigali Cooling Efficiency Program (K-CEP). The Initiative supports local and national governments to build know-how and implement enabling policies that will accelerate investment in low-carbon and climate-resilient district energy systems. It currently provides technical support to cities in four pilot countries (Chile, China, India and Serbia) and ten replication countries (Argentina, Bosnia and Herzegovina, Colombia, Egypt, Malaysia, Mongolia, Morocco, Russia, the Seychelles and Tunisia).	The District Energy in Cities Secretariat based in UNEP's Economy Division in Paris, with outpost offices in pilot countries and the Copenhagen Centre on Energy Efficiency in Denmark will provide technical support and guidance to the execution of the project. The Secretariat is a core actor in policy creation and technical advisory services, provides an up-to-date knowledge database on district energy, ensures quality control and technical backstopping, and builds partnership for implementation. The Initiative will be part of the selection panel of the National District Energy Financial Support Programme. UNEP Climate Change Mitigation GEF Unit will be the Implementing Agency of the project.

Stakeholder main group	**Stakeholder name**	**Existing activities with** **potential to be leveraged**	**Content engagement, contributions to the project (identified by Component)**
National support from other countries	DK Embassy	The Danish International Development Agency (DANIDA) is supporting the District Energy in Cities Initiative. The Energy Attaché at the embassy provides a key link in coordinating the project activities between Chinese and Danish energy authorities. Furthermore, the embassy has contact with Danish companies that can provide world-leading technical and consultancy solutions within district energy. They will be engaged to participate in the capacity building task force. The Ministry of Energy and the Danish Embassy in Chile signed a collaboration agreement in 2018 with the aim of strengthen and accelerate the implementation of mechanisms in district heating technologies and energy efficiency in buildings	The Danish Embassy in Chile will support knowledge transfer activities between the Danish District Energy Industry and Chile. They will contribute with expert support to the development of tender processes for district energy projects;
Local private sectors	SOFOFA	SOFOFA is a non-profit trade association that brings together companies and associations related to the Chilean industrial sector. It brings together about 4,000 companies, 48 industry associations and 22 regional business associations. All these members together comprise 100% of Chile's industrial activity and 30% of GDP.	SOFOFA (The Chilean industry Federation) has signed a collaboration agreement between the Ministry of the Environment, the Ministry of Energy and the UNEP to support the development of the energy systems and is part of this Proposal including co-finance and one professional from SOFOFA that will participate to address the challenges of the private sector in the district energy projects and could involve some companies in the implementation of any private sector project.
	Energy services companies, Technology providers and potential investors	Under the current global programme, the District Energy in Cities Initiative has organised events with utilities to present the projects and will also invite financial institutions at a later stage.	The private sector and investors are one of the main target groups of the project. The activity to bring projects to tender stage requires a market sounding exercise, meaning that potential private investors will be consulted to check their appetite for the project.

Stakeholder main group	**Stakeholder name**	**Existing activities with potential to be leveraged**	**Content engagement, contributions to the project (identified by Component)**
	Financial institutions and banks	Under the current global programme, the District Energy in Cities Initiative has organised events with utilities to present the DES projects initiatives in Chilean cities and will also invite financial institutions at a later stage.	Financial institutions and banks will be supportive to the outcome of the project, if they can be familiarised and mobilised for financing district energy system activities.
Local Academia and Research institutions	INACAP	INACAP is a private technical university and a centre for professional technical training	Technical university and research institution in Chile. INACAP will contribute to the development of dissemination material, methodologies, and tools, to the development of the website and the organization of awareness raising activities and delivery training sessions included under component 4.
Non-governmental organisation (NGOs), Indigenous groups and Environmental NGOs	Consumidores del Sur	The work of the NGO Consumidores del Sur in the city of Temuco is related to consumer rights.	No NGO focused on district energy or related could be identified so far.
	Citizens Observatory	Citizens Observatory[1] includes indigenous programmes at national level	The project will involve the NGOs in the development of dissemination and awareness raising activities and material to get their feedback and address their concerns.
	Regional Observatory for Gender and Ethnical Equality	Regional Observatory for Gender and Ethnical Equality[2], NGOs for indigenous groups, active in Temuco	
	Indigenous group in Puerto Williams	In the city of Puerto Williams there is an indigenous group in the sector of Villa Ukika that could be beneficiaries of a project in the whole city	
	FIMA[3]	FIMA is a non-profit NGO; FIMA works on contribution to policy, legislation and access regarding environmental issues in Chile.	The project will invite the NGOs to awareness raising activities to get their feedback and address their concerns.

Stakeholder main group	Stakeholder name	Existing activities with potential to be leveraged	Content engagement, contributions to the project (identified by Component)
	Fundación Terram[4]	Civil society organization contributing to aspects such as democracy, transparency, respect for rights, environmental justice, nature control and care of the environment.	
	Comité Pro-Defensa De La Flora y Fauna (CODEFF)[5]	NGO working towards the conservation of nature, the environment and the promotion of sustainable development.	
	Greenpeace Chile[6]	International NGO, working to defend the environment, promote peace and stimulate people to change attitudes and behaviours that put nature at risk.	
	Servicio Nacional del Consumidor (SERNAC)	Responsible for ensuring the protection of consumer rights	SERNAC activities to inform, educate and protect citizen consumers can be utilized and leveraged for the outreach activities of the project.

[1] https://observatorio.cl/our-programs/

[2] http://observatoriogenerosalud.ufro.cl/

[3] http://www.fima.cl/

[4] https://www.terram.cl

[5] https://www.codeff.cl/

[6] https://www.greenpeace.org/chile/

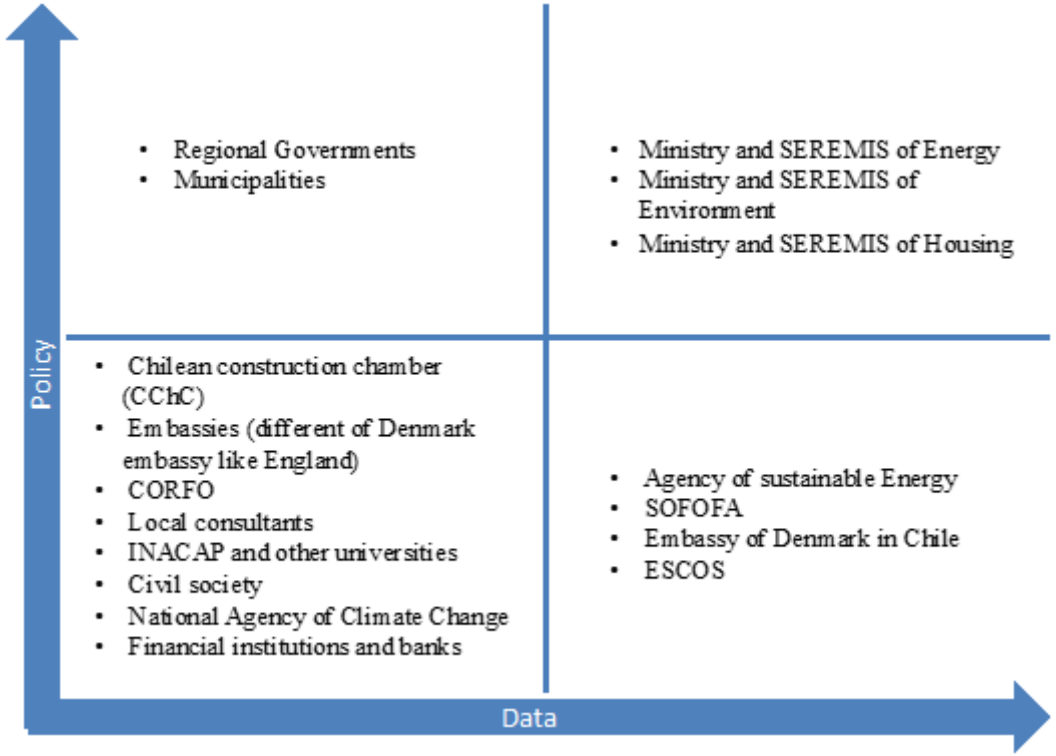
In addition, provide a summary on how stakeholders will be consulted in project execution, the means and timing of engagement, how information will be disseminated, and an explanation of any resource requirements throughout the project/program cycle to ensure proper and meaningful stakeholder engagement.

This project has been prepared based on consultations with international, national and local stakeholders undertaken throughout the implementation of the GEF funded District Energy in Cities Initiative in Chile. These consultations include participatory events and local meetings where next steps to advance district energy in Chile have been discussed. Civil society organizations, local communities, the national government, research institutions and private sector have taken part of these discussions.

At the national level, regular meetings have been held with the private sector, represented mainly by the Chilean construction chamber (CChC) and SOFOFA (the Chilean industry federation). SOFOFA represent 30% of the national GDP. Under this framework, SOFOFA has signed a collaboration agreement between the Ministry of the Environment, the Ministry of Energy and the UNEP to support the development of the district energy systems.

The below **Figure 7** summarize the stakeholder analysis of key entities at the national and local level in Chile and their relevance to the work of the project with regards to data provision and policy development, providing insights on the influence of different stakeholders on policy developments and on data needed for implementation of project activities. Stakeholders listed in the upper right box are considered to be the most influential both in terms of policy development and data collection. These stakeholders are considered as a top priority during the implementation of activities. Stakeholders listed in the bottom right box are given a second priority considering their importance on the data collection process; however, they are not considered as influential on policy development as the stakeholders in the upper right box.

Figure 7: Matrix of stakeholder analysis of key entities at the national and local level in Chile



Select what role civil society will play in the project:

Consulted only; Yes

Member of Advisory Body; Contractor;

Co-financier;

Member of project steering committee or equivalent decision-making body;

Executor or co-executor;

Other (Please explain)

3. Gender Equality and Women's Empowerment

Provide the gender analysis or equivalent socio-economic assesment.

- **<u>Gender analysis:</u> Provide the gender analysis or equivalent socio-economic assessment.**

Gender mainstreaming in energy projects has recognized the roles and responsibilities of women both as beneficiaries of electric power in their communities and as users of energy for domestic, production and community use. Whereas several studies exist on the links between energy access and welfare, and gender implications in general, focusing more on access to wood fuels, improved cooking technologies and access to electricity, little has been said on the gender implications of district energy. In fact, only a few studies seem to be available on gender implications and district heating.

According to official data in Chile, women account for 51% of the country's total population[1], the wage gap is 27% on average, and the percentage of households with female heads of household is 38%, where poverty and extreme poverty reach 15% and 5%, respectively.

As in many other OECD countries, one of the major obstacles Chilean women face to participate more fully in the labour market is the traditional gender roles towards work and care. Gender gaps in employment outcomes are also reflected in other domains: Chilean women earn less than men; they are under-represented in senior management positions; they are less likely to own a business; and, they hold few seats in parliament. Chile has introduced several measures to reduce gender inequalities, the most important one is the creation of the Ministry of women and gender equality in 2015. This Ministry is in charge of the design, coordination and evaluation of policies, plans and programs aimed to promote gender equality.

In March 2017, the Ministry of Energy has launched the “Agenda de Energía y Género” with four areas of work: the promotion and autonomous development of women, providing support to entrepreneurship and innovation; the design and implementation of energy policy, establishing a gender clause in agreements, contracts and terms of reference, along with participation in the design of policies; the strengthening of capacities in the energy field, through training; and access to goods and services offered, focusing and subsidizing, disseminating and sensitizing around the gender variable through workshops and seminars.

In April 2019, the Ministry of Energy has published its diagnosis of the situation of women in the energy industry sector and the proposal of a public-private gender action plan for this sector as part of a global and national strategy, which aims to incorporate the gender approach in the processes of energy transition.[2] The results of empirical studies on gender and the labour market in the country also make visible the multiple edges of inequalities between women and men and the persistence of cultural and organizational

resistance to changing the position of women in companies. The diagnosis is recommending the inclusion of the gender approach in the development of energy policies and specific policies for women which is reflected in the elaboration of gender action plans. The proposed action plan guides the joint action of the sector by proposing objectives, measures and goals to be achieved within a planned time horizon. A system of indicators tracks the progress of this process.

Table 5: Extract of the gender action plan for the energy sector - measures and actions

Main theme	**Measures**	**Key indicators (extract)**
Participation of women and sexual segregation in paid work	Measure 1: Support the training of women in the professional and technical skills demanded by the energy sector.	Number of companies that adhere to agreements with universities Number of companies in the private public committee. Number of companies that finance scholarships Number of contests sponsored during the period of implementation of the plan. Number of dissemination initiatives carried out by type of media. Number of companies that increase the offer of internships and professional practices for women in the sector.
Women's career: recruitment, hiring, permanence, rotation, training and promotion processes	Measure 2: Develop recruitment, selection and hiring processes for personnel free of gender bias. Measure 3: Gender-sensitive promotions and promotions policies Measure 4: Training in a gender approach applied to the characteristics of the functions developed in the organization	Number of companies offering courses. Number of companies that review promotion and promotion systems and incorporate gender criteria. Number of companies that have promotion and promotion support programs aimed at women. Number of companies that raise diagnoses of training needs in a gender approach. Number of companies that develop training initiatives on a gender approach.
Promotion of female leadership in headquarters and management	Measure 5: Promotion of female leadership in headquarters and management	Number of companies in the sector that have eliminated gender biases in job profiles Number of companies in the sector that have developed mentoring and / or leadership programs for women
Equal remuneration and labour benefits	Measure 6: Analysis and correction of wage inequalities	Number of companies in the sector that collect information on wage gaps and define salary policy Number of companies in the sector that have carried out audits and evaluations of positions.

Main theme	Measures	Key indicators (extract)
Reconciliation of personal, family and work life	Measure 7: Create conditions in companies that favour the development of men's and women's careers in conditions of equity.	Number of companies that have explicit reconciliation policy Number of companies in the sector with some additional benefit to workers of both sexes to attend to family situations. Number of companies in the sector that have more than one mechanism to make the working hours of men and women more flexible Number of companies in the sector that have adhered to Chilean regulation NCH 3262
Gender violence, health, safety, hygiene	Measure 8: Work environment free of gender violence and sexual harassment, safe and with a work environment that favours the integral development of people. Measure 9: Implementation of improvements in labour infrastructure with a focus on equity.	Number of companies in the sector that carry out systematic dissemination and training in gender violence and harassment Number of companies in the sector that prepare anti-discrimination code of conduct Number of companies in the sector that have a protocol
Governance and strategic management of the Plan	Measure 10: Explicit commitment of companies in the sector with non-discrimination, gender equality and equality. Measure 11: Communication and marketing without gender biases and equity prone Measure 12: Measures for governance, communication implementation, monitoring and monitoring of the Plan.	Registration of advances Number of companies incorporate gender equality and equality objectives in work plans Numbers of companies that review content and communication and dissemination practices and incorporate gender criteria. Number of companies offering gender training activities to communications and marketing teams Number of companies that join the Plan Management System Agreed goals Number of companies that spread the plan Increase in the number of companies represented in the Bureau Number of companies that raise baseline

Source: Ministerio de Energía / DEUMAN, 2019

Under the business as usual scenario existing heating system in southern cities of Chile impose elevated indoor pollution by the use of inefficient wood-burning cooking and wood-fired heaters. Women, young children and elderly are the most exposed to this condition because they spend most of their days inside homes. The consequences of the high level of exposition are directly correlated to the increase of cardiovascular diseases in these vulnerable groups. This project will contribute to improve indoor air quality by accelerating the implementation of district energy systems as alternative to the existing woodstoves. For each wood-burning cook stove that is replaced, indoor pollution by fine particulate matter is reduced by 99% inside that house.

The project will also contribute to the Agenda of Energy and Gender launched by the Ministry of Energy by engaging women, including capacity buildings activities delivered under Component 4.

- **Gender Action Plan: Provide a gender action plan (including indicators and end-of-project targets)**

The gender focal point at the Ministry of Energy will be designated as gender focal point and advisor for this project. She will be consulted and will provide guidance to the project management team on how to apply gender mainstreaming throughout the implementation of all project activities. The project will take into consideration the gender gap and the gender action plan of the Ministry of Energy (see above).. It will implement a cross-cutting strategy to guarantee that gender equality is considered and promoted throughout the implementation of the project. A proxy for the sector will be defined through tracking the participation of woman in district energy workshops and trainings from which we will the baseline and set a target that will lead us to an increase in participation of woman in the sector.

This project will perform the following gender-sensitive activities, as follows.

Table 6: Gender action plan

Activity	Indicator	Target
Crosscutting Activity :Project stakeholders will be sensitized regarding gender equality. Particular efforts will be made to promote balance between male and female participation. Women participation in trainings will be registered and encouraged.	Number of projects / pilot activities with women participation, incl. incorporation of gender equality and equality objectives in work plans	All pilot projects
Crosscutting Activity Gender inclusion will be encouraged by balancing gender representation in all working teams of the organizational chart, from the Steering Committee, the Project Management Unit and NDEO etc.	Number of women representation (in %) in involved institutions / project activities.	All pilot projects
Component 1: Gender equality will be promoted during all project's recruitment of personnel/consultants. All advertised positions will be equally opened to both genders and the text on terms of reference (ToRs) will be carefully checked to avoid any gender biases.	Number of hiring processes without gender biases / gender stereotypes in job profiles.	All pilot projects
Components 1 and 2: Gender aspects will be considered in the project selection criteria. The gender focal point at the Ministry of Energy and local women's NGO will be consulted in this activity	Project selection criteria developed under component 1 and 2 mentions gender and considers the potential impact on gender in the project evaluation.	Project selection criteria

Component 4: Documents and communication campaigns will be designed and targeted considering gender sensitiveness to assess and evaluate potential impact and related policy integration of specific gender considerations. Local women's NGO will be consulted during this process.	Number of training material, technology and methodology of dissemination	All material
Component 4: All training material, technology and methodology of dissemination must avoid gender stereotypes, employ inclusive language and use appropriate illustrations. Local women's NGO will be consulted during this process.	Number of training material, technology and methodology of dissemination	All material
Component 4: Significant women representation will be encouraged during capacity building workshops (both, among trainers and trainees) to promote gender parity. Local women's NGO will be consulted for this activity.	Number of women participating in capacity building workshops	30% share of women

Whenever it is possible and/or relevant, the project will aim to include gender-disaggregated data. Gender will be addressed in the project team and stakeholder meetings, to help identify other areas where gender goals could be established. The project will work with close coordination with the gender focal point of the Ministry of Energy, mainly for communication campaigns and the demonstration programme.

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[1] Censo, 2017: http://www.censo2017.cl

[2] Ministerio de Energía / DEUMAN, 2019: Diagnóstico de la Situación de Inserción de las Mujeres en el Sector Energético, Santiago, April 2019

Does the project expect to include any gender-responsive measures to address gender gaps or promote gender equality and women empowerment?

Yes

Closing gender gaps in access to and control over natural resources;

Improving women's participation and decision making

Generating socio-economic benefits or services or women Yes

Does the project's results framework or logical framework include gender-sensitive indicators?

Yes

4. Private sector engagement

Elaborate on the private sector's engagement in the project, if any.

The private sector will be engaged in the project through the following stakeholders:

- The **Agency of Sustainability Energy**: The Agency is the articulating arm of the Energy Ministry, which is responsible for implementing government programs on energy efficiency. It's not a private sector institution, but it helps to mobilize the private sector. It is a foundation whose mission is to promote, strengthen and consolidate the efficient use of energy, articulating the relevant actors, nationally and internationally, and implementing public-private initiatives in the different sectors of energy consumption, contributing to the competitive and sustainable development of the country. It implements specific programs and projects that promote the reduction of energy consumption, incl. the engagement of the private sector. They focus on Industry, mining, transport and building private sector and on education and dissemination on energy efficiency. The Agency of Sustainability Energy will host the National District Energy Office and will manage and implement the National District Energy Financial Support Programme.

- The **Chilean Industry Federation (SOFOFA)**: SOFOFA has signed a collaboration agreement between the Ministry of the Environment, the Ministry of Energy and UNEP to support the development of the energy systems and is part of this Proposal including co-finance and one professional from SOFOFA that will participate to address the challenges of the private sector in the district energy projects. SOFOFA is a non-profit trade association that brings together companies and associations related to the Chilean industrial sector. It brings together about 4,000 companies, 48 industry associations and 22 regional business associations. All these members together comprise 100% of the industrial activity of Chile and 30% of GDP.

- **District Energy in Cities Initiative** (the Initiative): The Initiative is private-public partnership hosted by UNEP and with participation of 25 private sector companies: Atoll Energy, Broad Energy, Carbon Trust, China Energy Conservation and Environmental Protection (CECEP) Group, Clarke Energy, Dalkia, Danfoss, Devcco, Emaar District Cooling, Empower, Energy Efficiency Services Limited (EESL), Engie, Enova, Goteborg Energy, Johnson Controls, King & Spalding, Optit, Renew Power, Solar Turbines, Sustainability Solutions Group (SSG), Tabreed, Thermaflex, Thermax, Trane, Veolia. The Initiative has created a working group integrated by engineering companies, district energy operators and private consultancies to support the work performed by the Initiative in Chile. The Initiative will continue providing this support throughout the implementation of this project as technical advisors.

- **Technology providers and potential investors** like private utilities are part of the DES Initiative and get consulted to provide technical advice. In the cities receiving support under Component 2 of the project, a multi-stakeholder coordination group will be established, equivalent to the activities in Temuco under the global Initiative. This will be helpful and beneficial to bring all local stakeholders around the table, potentially including local private utility, or community representatives.

As part of the support provided under Component 2, the activity to bring projects to tender stage requires a market sounding exercise, meaning that potential private investors will be consulted to check that their appetite on the project. Under the current global programme, the District Energy in Cities Initiative has organised events with utilities to present the projects and will invite as well financial institutions at a later stage.

5. Risks

Elaborate on indicated risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, the proposed measures that address these risks at the time of project implementation.(table format acceptable):

Table 7: Potential risks and proposed mitigation measures

Risk description	Main category	Impact severity	Likelihood	Risk Mitigation Strategy and Safeguards	By Whom / When?
General: National government engagement and project governance					
1. National Government ministries remove their support for the project, including due to political or social change	Political	High	Low	· The Project has been given permission to be executed by the Ministry of Energy. UNEP has received letters of endorsement from Ministry for the project activities. · Involve the Ministry of Environment and Ministry of Housing as key implementing partners closely in the project to ensure their participation (e.g. of review current programmes to support district heating), ensure the continued participation of such ministries during moments of political change that may occur · The Ministries are part of the current National Steering Committee at national and local level in Temuco.	UNEP Throughout the project.

Risk description	Main category	Impact severity	Likelihood	Risk Mitigation Strategy and Safeguards	By Whom / When?
2. Co-finance partners remove support for the project	Political and organizational	Medium	Low	· Liaise constantly with potential partners operating and interested in district energy. Other private and public institutions are very interested in the project and could be part of the project in case current co-finance partners decline or leave the project.	UNEP Implementing Partners Throughout the project.
3. Local Governments cities remove support for the project (by change of government or changing priorities), including due to regional or municipal elections in 2020 (or beyond)	Political	High	Medium	· A removal of support from one or more city's local governments will require additional cities to sign up to receive support in order to meet the deliverables of Component 2. Therefore, the project will be in dialog with a number of cities interested in financial support for district energy in their cities, in order generate a pipeline of other cities that can be selected if local government support is lost in more than one city	Agency of Sustainability Energy UNEP Ministry of Energy Ministry of Environment Throughout the project.
Component 1: Establishment of a National District Energy Office (NDEO)					

Risk description	Main category	Impact severity	Likelihood	Risk Mitigation Strategy and Safeguards	By Whom / When?
4. For establishing the NDEO no suitable qualified national professionals can be hired (there are limited professionals working in the specific field of district energy in Chili; the private sector could be more attractive than the public sector for potential candidates, e.g. due to the salaries).	Organizational and institutional	High	medium	· The positions at the NDEO will be competitive to attract suitable, well-educated candidates. The salary will be orientated to the Chilean benchmarks in public institutions. · Provide training sessions with the help of the District Energy in Cities Initiative to improve the knowledge and specific capabilities of the professional, if required.	Agency of Sustainability Energy Throughout the project.
5. Lack of interest from local authorities to launch requests for proposals to build the projects	Political	High	Low	· Inspired and supported by the District Energy in Cities Initiative, the Mayors of municipalities are planning some projects in their communes. Temuco has developed a pre-feasibility study on their own. Renca is including district energy in the Plans of Territorial Ordering. The project will build on this enthusiasm of the communes and it will help to engage other municipalities to develop a project.	Agency of Sustainability Energy UNEP Municipalities Throughout the project.
6. NDEO is not able to identify a way to continue sustainable operations after project completion	Organizational	High	Low	· Both the Sustainability Agency and the Ministry of Energy guarantee the sustainability of the NDEO after project completion. · Work with the Sustainable Agency and the Ministry of Energy to develop a business model for the NDEO's continued operations post project.	Agency of Sustainability Energy UNEP Ministry of Energy
Component 2: Demonstration of financial feasibility of district energy projects					

Risk description	Main category	Impact severity	Likelihood	Risk Mitigation Strategy and Safeguards	By Whom / When?
7. Investors are not interested in applying for tenders	Financial	High	Low	· Make feasibility studies public and invite international peer review. Increase transparency on permitting process and planned national government support (e.g. in coordination, connection guarantees etc.). Increase awareness raising to private sector. The likelihood of this risk is very low. Several companies have already expressed interest in investing on district energy in Chile.	Agency of Sustainability Energy SOFOFA Embassy of Denmark UNEP Throughout the project.
8. Projects fall through and are not investable	Financial	High	Medium	· Local governments will receive support and guidance from an expert team through the National District Energy Financial Support Programme and will receive advice on whether the projects need a more detailed financial assessment to identify economic viability or not. Only projects with high potential will be invited to ask for additional support for project commercialization.	Agency of Sustainability Energy UNEP Ministry of Energy Ministry of Environment Throughout the project.

Risk description	Main category	Impact severity	Likelihood	Risk Mitigation Strategy and Safeguards	By Whom / When?
9. No investor bids attracted for pilot projects	Financial	High	Low	· Selection of pilot cities contingent on presence of investor interest. · UNEP's partners include development banks, law firms and DES operators that can provide advice on the bankability and commercial viability of the demonstration project. · UNEP will provide training on local planning policies that create the enabling environment for investment in DES and also provide policy and regulatory advice through the development of the city-wide plan that can help to unlock investment (under Component 3).	Agency of Sustainability Energy UNEP Ministry of Energy International partners and financiers Throughout the project.

Risk description	Main category	Impact severity	Likelihood	Risk Mitigation Strategy and Safeguards	By Whom / When?
10. City does not want to adopt city-wide plan of policies and investments	Political	High	Medium	· The Executing Agency supported by UNEP will contract an organisation to be responsible for delivery of the city-wide energy master plan but will ensure that its development is in deep consultations with the local government and multi-stakeholder coordination structure. · UNEP will consult the city on the drivers and goals of the pilot city and calculate and present the benefits of implementing the plan in relation to these and against other technology options. · The city-wide plan will be reviewed at multiple stages with significant input from the pilot city. · UNEP will present international best practice of the importance of having a long-term plan for district energy in-terms of reducing costs and maximising environmental benefits.	Agency of Sustainability Energy UNEP Throughout the project.
Component 3: Designing an enabling regulatory framework at national and local level					

Risk description	Main category	Impact severity	Likelihood	Risk Mitigation Strategy and Safeguards	By Whom / When?
11. Inadequate support/will from local authorities and other stakeholders to commit to policies and regulations	Political	High	Low	· 12 cities have already attracted and joined the District Energy in Cities Initiative in Chile. · Rapid assessments are being completed in these 10 cities and potential pilot projects will be identified. · The private sector is very interested in the new projects and has developed pre-feasibility studies. · The PMU integrated by the Ministry of Energy, the Ministry of Environment and UNEP are establishing multi-stakeholder coordination groups and all of them are committed to the development of district energy. This work will continue. · Pilot cities are selected based on the ability for DES to meet local strategy and drivers, city interest to provide co-finance and make local policy changes for district energy. Cities will provide an official letter confirming the engagement of the city in the activities, confirming co-finance and commitments to implement a policy, programme, or action related to DES.	Agency of Sustainability Energy UNEP Throughout the project.
Component 4: Outreach, trainings and dissemination of results to scale-up the market					

Risk description	Main category	Impact severity	Likelihood	Risk Mitigation Strategy and Safeguards	By Whom / When?
12. End users are not interested in connecting to a district energy network	Social	High	Low	· Awareness raising activities, communications campaign and tailored training modules under Component 4 will mitigate this risk.	Agency of Sustainability Energy UNEP INACAP Throughout the project.
13. Other cities are not attracted by the outreach activities	Technical	Medium	High	· UNEP and the Executing Agency as well as the Ministry of Energy have already attracted significant interest from cities in the project through ongoing outreach activities · UNEP has partnered with city network organisations to raise the profile of the Initiative across cities. · UNEP's global awareness programme will demonstrate the benefits of cities joining the project.	Agency of Sustainability Energy UNEP Ministry of Energy Throughout the project.

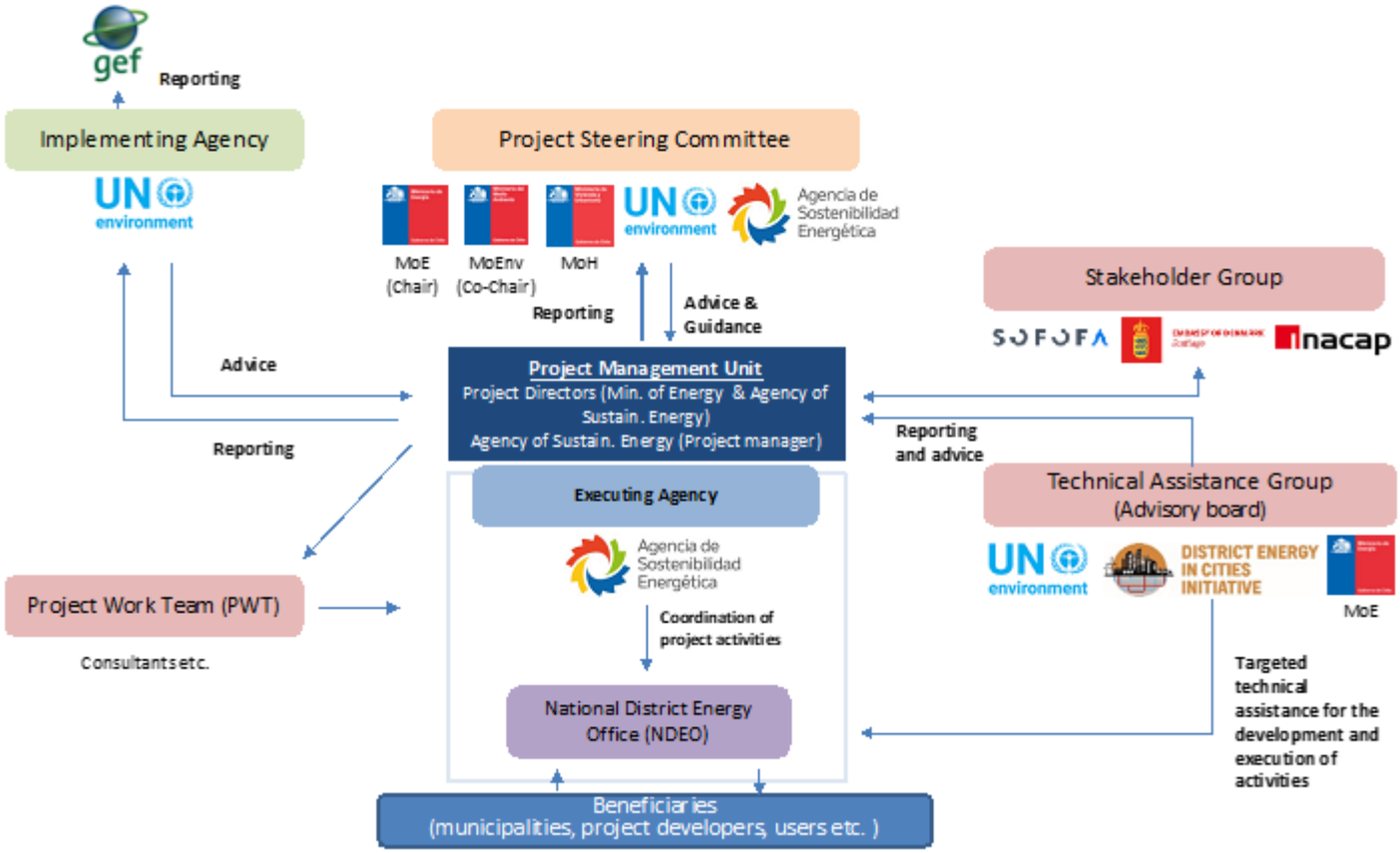
6. Institutional Arrangement and Coordination

Describe the institutional arrangement for project implementation. Elaborate on the planned coordination with other relevant GEF-financed projects and other initiatives.

· Institutional arrangements: Describe the institutional arrangement for project implementation.

The project will be implemented by UNEP and co-executed by the Ministry of Energy and the Ministry of Environment, with support from the Agency of Sustainability Energy, and with targeted technical assistance from the UNEP through the District Energy in Cities Initiative Secretariat. A project steering committee will be created to supervise and provide guidance to the project execution. It will comprise the Ministry of Energy, the Ministry of Environment and UNEP.

Figure 8: Institutional setup and coordination structure



The Agency of Sustainability Energy will be accountable to the Ministry of Energy and UNEP/GEF for ensuring the Executing Agency activities (see Annex K). The project will be managed by a Project Manager at the Agency of Sustainability Energy that works in close cooperation with the Project Director at the Ministry of Energy.

· Coordination with other initiatives: Elaborate on the planned coordination with other relevant GEF-financed projects and other initiatives.

Ministry of Energy coordinates all energy activities of the country. As the National Director will be from the Ministry, this will facilitate coordination with other national initiatives and the following GEF-financed projects that are related to energy efficiency and implemented in an similar sector (e.g. residential sector):

- *Leapfrogging Chilean's Markets to More Efficient Refrigerator and Freezers* (GEF Project ID: 9496[1]): The project aims at accelerating the transformation of Chile's markets to more energy efficient (EE) residential refrigerators/freezers thereby achieving reduction of GHG emissions and contributing to improved energy access and energy security. The project is also led by the Ministry of Energy and executed by Fundación Chile on behalf of the Ministry. The Ministry of Energy working to promote energy efficiency will coordinate the activities and communication of energy efficiency for two projects.
- *Strengthening Chile's Nationally Determined Contribution (NDC) Transparency Framework* (GEF Project ID: 9835[2]): The project's objective is to strengthen and improve the transparency mechanisms of Chilean national institutions for domestic and UN conventions reporting. This is a GEF Capacity-building Initiative for Transparency (CBIT) project supporting Chile to improve its transparency framework for meeting the requirements of the Paris Agreement and is executed by the Ministry of Environment. It also has the task of tracking Chile's process to achieve its NDC. Any outcome in terms of GHG reductions monitored under the district energy project will be passed to the Ministry of Environment. In addition, the proposed MRV framework under the project will be aligned with the national transparency framework and hence support the CBIT project in tracking progress on its contribution to the Chilean NDC.

The Ministry of Energy together with the Ministry of Environment will coordinate the project activities also in the light of the Climate & Clean Air Coalition (CCAP[3]) initiated by UNEP. Chile joined the Coalition to strengthen its activities to reduce short-lived climate pollutants (SLCPs) both domestically and abroad. The project will support the objectives of the CCAP by reducing emission steaming from burning wood, such as PM.

As executing arm of the Ministry of Energy, the Agency of Sustainability Energy is working in different action lines on energy efficiency and renewable energies. The Agency has created the Department of Clean Fuels and Air Conditioning Technologies that include the district energy technology as a work line and will act as Project Director of the Agency of Sustainability Energy in the current project. This Department is currently working on two studies: "Legal assessment for the execution of district energy projects" and "Pre-feasibility of the German Becker Park district energy project". Both assessments will be share by the NDEO with project developers. The Agency of Sustainability Energy is also hosting and managing other energy efficiency initiatives in Chile such as the "Comuna Energética", Energy Communes in English. Under the "Comuna Energética" initiative the Agency of Sustainability Energy supports local governments in establishing energy efficiency goals and develops a local strategy to improve energy efficiency and to increase the rate of

renewables in the city. NDEO will coordinate with the “Comuna Energética” team at the Agency of Sustainability Energy to make sure that district energy is considered in the local energy strategies.

Furthermore, this project will receive technical support from the GEF funded District Energy in Cities Initiative (the Initiative), one of the energy efficiency accelerators of SE4All. The Initiative will coordinate activities implemented in Chile with the also GEF funded Building Energy Efficiency Accelerator. The project will invite focal points for both initiatives to join technical meetings. The current activities of the District Energy in Cities Initiative in Chile will officially close in April 2020 and most of the reports and assessments will be finalized in December 2019. After creation of the NDEO hosted by the Agency for Sustainable Energy, the District Energy in Cities Initiative will provide its detailed information on the progress made and the status of the work on district energy in each city and also at national level. Additionally, the initiative will compile all methodologies and tools developed under the Global Initiative for the NDEO and we will train the staff on how to use them. See Annex K for further details of this support.

Additionally, under the different international agreements between the Ministry of Energy and international organizations, the Ministry is starting a technical cooperation with the Inter-American Development Bank (IDB) with the aim of develop different technical, economic, environmental and impact assessments to promote the use of geothermal resources in district energy projects. These assessments will be available and will be share by the NDEO with projects developers. Besides, the Ministry of Energy and The World Bank have a Cooperation Agreement under the umbrella of the support that is bringing the Clean Technology Fund to the Government of Chile. Since 2017, the Ministry of Energy is executing the technical assistance for the Sustainable Geothermal Development that is bringing the help to the Chilean Government for improve the geothermal market condition and overcome social and economic barriers for the promotion and the development of the geothermal resources in Chile. In 2019, the study “District Energy assessment for Coyhaique and Puerto Williams” developed the technical and economic pre-feasibility of a project of district heating in the whole city of Coyhaique and Puerto Williams in the south of Chile. This assessment will be available for the municipalities of Coyhaique and Cabo de Hornos (Puerto Williams).

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[1] https://www.thegef.org/project/leapfrogging-chilean-s-markets-more-efficient-refrigerator-and-freezers

[2] https://www.thegef.org/project/strengthening-chile-s-nationally-determined-contribution-ndc-transparency-framework

[3] https://ccacoalition.org/en/partners/chile

7. Consistency with National Priorities

Describe the consistency of the project with national strategies and plans or reports and assesments under relevant conventions from below:

NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc.

The project is consistent with national strategies and plans/reports and assessments under the following relevant conventions:

- National Energy Strategy 2012-2030
- Energy 2050 (Chile’s Energy Policy)
- National Action Plan for Climate Change 2017-2022
- National Determined Contributions (NDC) Paris Agreement
- Long-term low greenhouse gas emission development strategies under UNFCCC (Article 4, paragraph 19, of the Paris Agreement)
- National Communications (NC) under UNFCCC
- Technology Needs Assessment (TNA) under UNFCCC
- National Climate Change Adaptation Plan
- United Nations Development Assistance Framework (UNDAF)

National Energy Strategy 2012-2030: Chile’s National Energy Commission (CNE) has adopted a policy document, “National Energy Strategy: 2012–2030,” which outlines its commitment to expand the sector capacity by supporting the use of non-conventional renewable sources. The Strategy contains six main pillars, among which:

- Increase the use of non-conventional renewable sources,
- Promotion of energy efficiency.

Energy 2050 (Chile’s Energy Policy): The Energy Policy defines a vision of Chile's energy sector by the year 2050 as reliable, inclusive, competitive and sustainable. The Energy Policy is based on four pillars: Quality and Security of Supply, Energy as a Driver of Development, Environmentally friendly Energy, and Energy Efficiency and Energy Education. The principle energy targets for 2050 are:

- The GHG emissions of Chile's energy sector are in line with the thresholds defined by international guidelines and with the corresponding national emissions reduction goal, making an important contribution to a low carbon economy,
- Regional and local territorial planning and land-use instruments are in line with the guidelines of the Energy Policy,
- At least 70% of the electricity generated in Chile will come from renewable energy sources (60% by 2035),

- 100% of new buildings meet OECD standards for efficient construction, and are fitted with intelligent energy control and management systems,
- Improvement of energy producers, distributors, consumers and users' behaviours.

National Action Plan for Climate Change 2017-2022: Chile's Plan of Action for Climate Change is a road map that integrates and systematizes future climate actions for the country. The action plan has 16 specific objectives and 30 action lines that are materialized in 96 measures, divided in four areas of action: adaptation, mitigation, means of implementation and management of climate change at regional and communal level. The National Action Plan on Climate Change refers to district energy at several proposed actions, e.g.:

- Action line 11. Mitigation actions for low carbon building, urbanization and public infrastructure
- Mitigation action 26: Evaluate the reduction of black carbon (BC) and carbon dioxide (CO2) emissions through the implementation of the Atmospheric Decontamination Plans Strategy.
- Mitigation Action of the Energy Sector number 7: Increase the consumption of more efficient and sustainable biomass fuels (incl. starting district heating pilots in areas that have Decontamination Plans and define business models that make their economic feasibility viable in order to move from individual heating to the collective in urban areas, where cost is effective.)

National Determined Contributions: Chile has submitted its INDC to the Secretary of the UNFCCC in September 2015. The country´s commitments are divided into 5 pillars: i) mitigation, ii) adaptation, iii) capacity building and strengthening, iv) development and Technology Development and Transfer, and v) financing.

In the case of the Mitigation Pillar, Chile is committed to reduce its CO_2 emissions per GDP unit by 30% below their 2007 levels by 2030, considering a future economic growth which allows to implement adequate measures to reach this commitment.

In addition, and subject to the grant of international monetary funds, the country is committed to reduce its CO_2 emission per GDP unit by 2030 until it reaches a 35% to 45% reduction with respect to the 2007 levels, considering, in turn, a future economic growth which allows to implement adequate measures to achieve this commitment.

In the specific contributions to the LULUCF sector, Chile has committed to the sustainable development and recovery of 100,000 hectares of forest land, mainly native, which will account for greenhouse gas sequestrations and reductions of an annual equivalent of around 600,000 tons of CO_2 as of 2030. This commitment is subject to the approval of the Native Forest Recovery and Forestry Promotion Law.

The development of a District Energy Market in Chile will help to reach the commitment of the country to reduce its CO_2 emissions by 2030. While a high penetration of poor quality wood for heating in household of the central south regions, and the use of fossil fuels like kerosene or gas in inefficient unitary stoves in the residential, commercial and public sectors, district heating is an efficient alternative to reduce emissions from fossil fuels and to avoid the use of poor quality wood without sustainable management of forestry.

Long-term low greenhouse gas emission development strategies under UNFCCC (Article 4, paragraph 19, of the Paris Agreement: The Energy Agenda in Chile (2014) has as one of its targets to promote the efficient use of energy and establishes a target of energy savings of 20% by 2025, considering the increase in energy consumption by then. The implementation of many programmes and campaigns, as well as the future Law for Energy Efficiency (submitted to congress in September 2018) aims for a total saving of 20,000 GWh/year.

The National Action Plan for Climate Change 2017-2022 considers, within the mitigation measures, the adoption of sustainable heating systems focused on district energy. Likewise, the district heating penetration is considered as a strategic opportunity within the Air Decontamination Plans to reduce the emissions of local pollutants as PM_{10}, $PM_{2,5}$ and global as CO_2.

The Ministry of Energy, for its part, includes district heating in public policies: Energy Policy 2050, National Policy on the use of Firewood and Derivatives for Heating, and Energy Route 2018-2022, as a way to improve energy efficiency in the commercial, public and residential sector. In addition, it is developing Local Energy Strategies at the municipal level. The National Energy Strategy establishes that by 2050 the use of cost-effective biomass district heating systems should prevail in high polluted zones over the individual systems and that 65% of the fuels used in the national fuel matrix should be low GHG and low pollutants by 2050.

National Communications: According Chile's Third National Communication on Climate Change, in 2013, the total GHG emissions (excluding forestry, and other land uses) amounted to 109,908.8 Gg CO_2eq, an increase of 113.4% since 1990 and of 19.3% since 2010. The main GHG emitted by Chile was CO_2 (78.4%), followed by CH_4 (10.7%), N_2O (10.0%), and fluorinated gases (0.9%). The Energy sector is the largest GHG emitter in Chile (77.4%).

GHG emissions from the energy sector amounted to 85,075.4 Gg CO_2eq, an increase of 156.1% since 1990 and of 22.5% since 2010. In general, this is mainly due to the increase in energy consumption in the country, including the consumption of coal and natural gas for electricity generation and consumption of liquid fuels, mostly diesel and gasoline, for road transportation. With regards to subcategories, the Energy Industries (mainly Main activity electricity and heat production) is the leading source of GHG emissions within the sector, with 45.3% share in 2013, followed by 28.9% from Transport (mainly road transportation), 16.8% from Manufacturing industries and construction, and 8.0% derives from Other sectors (mainly Residential). The Oil and natural gas subcategory accounted for 0.9%, while Solid fuel accounted for 0.1%

The Ministry of Energy and its related entities, such as the National Energy Commission (CNE) and the Agency of Sustainability Energy have been key players in technological transfer, since technology incorporation in this sector may be a great contribution to GHG reduction. On the other hand, Chilean needs on financing, capacity and technology shown by the different areas of climate change (mitigation, adaptation, reports, inventory, international negotiation) increase the country's vulnerability.

As Energy sector is the largest GHG emitter in Chile, District Energy represent an opportunity to introduce a new technology in the country with demonstrative projects that will show the benefits and scale up the technology in order to reduce the amount of GHG emissions. Business models, financing, local capacity and technology will be studied trough the pilot projects and bring the knowledge to open a market in district energy that allow decrease the country's vulnerability to climate change.

Technical Needs Assessments (TNA): According the First Technology Needs Assessment of Chile, the use of CHP in the industry sector could reduce GHG from the fossil fuels. The efficient use of biomass in CHP in the industry of pulp and paper could reduce great amount of GHG and improve the global energy efficiency.

Geothermal energy is also a way to reduce GHG in electric generation and heating in compare with gas/kerosene stoves and boilers.

District energy could use CHP plants or Geothermal Energy to supply a lot of buildings in a district, therefore will reduce CO_2 emissions in compare with the business as usual with the adoption of this technology.

National Climate Change Adaptation Plan: Chile's National Climate Change Adaptation Plan was adopted in 2015 and provides the overall framework for the coordination of adaptation activities of different sectors and different territorial administrative levels. Climate Change Adaptation Plan for Energy Sector is based on measures related to energy efficiency on demand side and use of non-conventional renewable energy on energy generation side. According to this Plan, in order to increase the energy efficiency it is necessary to introduce measures to popularize the development of energy efficiency projects and develop massive campaigns and educational programs in energy efficiency; while in order to increase the use of non-conventional sources it is necessary to encourage the integration of non-conventional sources of energy in line with Renewable Energy Law and the use of solar energy in residential sector.

United Nations Development Assistance Framework (UNDAF): Chile has signed the United Nations Development Assistance Framework (UNDAF) for the period 2019-2022 in August 2019. UNDAF identifies the assistance that the UN System will provide to the country in achieving Sustainable Development Goals (SDGs) under the 2030 Agenda. The UNDAF was finalized as a result of the dialogue and negotiations between representatives of the UN system and numerous governmental bodies. It identifies areas of joint cooperation on issues of institutional, social and economic development, gender equality and environmental sustainability.

8. Knowledge Management

Elaborate the "Knowledge Management Approach" for the project, including a budget, key deliverables and a timeline, and explain how it will contribute to the project's overall impact.

a) External knowledge management will be undertaken through two approaches: i) the national website on district energy ii) the District Energy in Cities Initiative

District Energy Website: The website will be integrated into the Agency of Sustainability Energy website and will be used to disseminate project results, raise awareness and communicate on existing opportunities to receive support to develop district energy projects. This website could include the following sections subject to the final design and content available and required:

- ***Demonstration projects fact sheets**:* this section will include a summary of the technical and economic characteristics of all the demonstration projects developed in Chile.
- ***International case studies and best practices***: This section will be linked to the District Energy in Cities Initiative and will include international case studies and best practices on district energy.
- ***Supporting mechanisms for project development***: The National District Energy Office, the National District Energy Financial Support Programme and existing funding opportunities to develop projects.
- ***Resources/Live-Lab***: reports, summaries, recordings and live-stream from workshops and webinars, methodologies, tools and infographics will be available for download.
- ***Project Market Place:*** a matchmaking space between developers; investors; ESCOs and public entities to attract investment and encourage project development.
- ***Training modules:*** detailed training modules developed using international best practices and modules developed during deep-dive support to cities.
- ***Webinars:*** Training and outreach will also be achieved through a series of webinars targeting specific training subjects important to local stakeholders, cities and/or local governments.
- ***News/Media and Event Calendar:*** blog posts, news updates, partner events as well as media tool kits with tailored communication.

District Energy in Cities Initiative: as a platform for knowledge transfer, the District Energy in Cities Initiative will enable the transfer of international best practices from partners and champion cities of Initiative to the local stakeholders in Chile. Partners and champion cities will support through the participation on awareness raising activities, training sessions and webinars, and will also provide guidance on the development of methodologies and tools.

b) Internal knowledge management will be undertaken through monthly coordination calls or meetings between the NDEO and the advisory board, annual meetings of the National District Energy Steering Committee, regular coordination calls between the NDEO and the sponsors of the projects under assessment. The NDEO will develop a methodological approach to track activities, knowledge developed, and the impacts of its work.

9. Monitoring and Evaluation

Describe the budgeted M and E plan

The project will comply with the UNEP standard monitoring, reporting and evaluation procedures. Reporting requirements and templates are an integral part of the UNEP legal instrument to be signed by the executing agency and UNEP. The project's M&E plan is consistent with the GEF Monitoring and Evaluation policy. The Project Results Framework presented in Annex A includes SMART indicators for each expected outcome as well as mid-term and end-of-project targets. These indicators along with the key deliverables and benchmarks included in Annex I will be the main tools for assessing project implementation progress and whether project results are being achieved. The means of verification and the costs associated with obtaining the information to track the indicators are summarized in Annex A and budgeted in Annex J - M&E Budget and Workplan (presenting M&E related costs fully integrated in the overall project budget).

The M&E plan will also consider and apply the Guidance for an MRV Framework of District Energy Activities in Cities developed by the UNEP District Energy in Cities Initiative. This guidance on measuring, reporting and verifying (MRV) enables projects and cities under the District Energy in Cities Initiative to track progress on city-wide district energy systems and their impact. The guidance facilitates the monitoring of projects' impacts proposing a broad approach to MRV that addresses 1) greenhouse gas emissions and 2) sustainable development. In particular, city authorities and relevant stakeholders (utilities, private sectors, etc.) shall be enabled to evaluate planned and implemented projects with regards to mitigation impacts and sustainable development benefits. The MRV framework will be adopted and adapted to the pilot cites and project specific situations an individual MRV Plan prepared based on the MRV guidance.

The M&E plan presented in Annex J will be reviewed and revised as necessary during the Inception Workshop (IW) to ensure project stakeholders understand their roles and responsibilities with regards to the project monitoring and evaluation. Indicators and their means of verification may also be fine-tuned at the IW. General project monitoring is the responsibility of the project management unit but other project partners will have responsibilities to collect and provide specific information to track the indicators. It is the responsibility of the Project Manager to inform UNEP of any delays or difficulties faced during implementation so that the appropriate support or corrective measures can be adopted in a timely fashion.

The project Steering Committee will receive periodic reports on progress and will make recommendations to UNEP concerning the need to revise any aspects of the Results Framework or the M&E Plan. Project oversight to ensure that the project meets UNEP and GEF policies and procedures is the responsibility of the Task Manager in UNEP-GEF unit UNEP Climate Change Mitigation Unit). The Task Manager will also review the quality of draft project outputs, provide feedback to the project partners and establish peer review procedures to ensure adequate quality of scientific and technical outputs and publications.

Project supervision will take an adaptive management approach. The Task Manager will develop a project supervision plan at the inception of the project, which will be communicated to the project partners during the IW. The emphasis of the Task Manager supervision will be on outcome monitoring but without neglecting project financial management and implementation monitoring.

Progress on delivering the agreed project global environmental benefits will be assessed with the Steering Committee at agreed intervals. Project risks and assumptions will be regularly monitored both by project partners and UNEP. Risk assessment and rating is an integral part of the Project Implementation Review (PIR). The quality of project monitoring and evaluation will also be reviewed and rated as part of the PIR. Key financial parameters will be monitored quarterly to ensure cost-effective use of financial resources.

In-line with UNEP Evaluation Policy and the GEF's Monitoring and Evaluation Policy, the project will be subject to a Terminal Evaluation and, additionally, a Mid-Term Review will be commissioned and launched by the Project Manager before the project reaches its mid-point. The possibility of a Mid-Term Evaluation will be discussed with the Evaluation Office.

The Evaluation Office will be responsible for the Terminal Evaluation (TE) and will liaise with the Task Manager and Executing Agency(ies) throughout the process. The TE will provide an independent assessment of project performance (in terms of relevance, effectiveness and efficiency), and determine the likelihood of impact and sustainability. It will have two primary purposes: (i) to provide evidence of results to meet accountability requirements, and (ii) to promote learning, feedback, and knowledge sharing through results and lessons learned among UNEP, the GEF, executing partners and other stakeholders. The direct costs of the evaluation will be charged against the project evaluation budget. The Terminal Evaluation will be initiated no earlier than six months prior to the operational completion of project activities and, if a follow-on phase of the project is envisaged, should be completed prior to completion of the project and the submission of the follow-on proposal. Terminal Evaluations must be initiated no later than six months after operational completion.

The draft TE report will be sent by the Evaluation Office to project stakeholders for comment. Formal comments on the report will be shared by the Evaluation Office in an open and transparent manner. The project performance will be assessed against standard evaluation criteria using a six point rating scheme. The final determination of project ratings will be made by the Evaluation Office when the report is finalised and further reviewed by the GEF Independent Evaluation Office upon submission. The evaluation report will be publically disclosed and may be followed by a recommendation compliance process.

10. Benefits

Describe the socioeconomic benefits to be delivered by the project at the national and local levels, as appropriate. How do these benefits translate in supporting the achievement of global environment benefits (GEF Trust Fund) or adaptation benefits (LDCF/SCCF)?

The Project aims to achieve the following socioeconomic benefits:

Table 8: Sustainable development benefits of the project

SDG / Category	SDG target	Project impact	Project indicator
Environment			

SDG / Category	SDG target	Project impact	Project indicator
SDG 11	11.6: By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	· There is a huge potential to improve city-wide air quality in Chile through reduced burning of fossil fuels that produce sulphur dioxide (SO_2), nitrogen oxides (NO_x) and particulate matter (PM) and associated heat benefits · Increased visibility due to lower pollution	· Mean urban air pollution of particulate matter (PM10 and PM2.5) in Chilean (pilot) cities · Mean concentration of CO, SO_x, NO_x in Chilean (pilot) cities · Share of households and commercial users connected to DES in Chilean (pilot) cities
Socio-Economic			
SDG 3	3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	· Health benefits from greater utilization of the heating system by fuel-poor populations, due to more affordable provision of heat · Improvements in air quality that could reduce spending on health costs or environmental penalties · Reduced household and ambient air pollution (in particular through replaced wood stoves, such as in Temuco) · Improved livelihoods /urban quality of life: Improved safety as individual boilers and stoves are removed from buildings, reduced fire risk as fuels (in particular wood in Chile, such as Temuco) are centrally managed, reduced legionella disease risk through central operation	· Mean urban air pollution of particulate matter (PM10 and PM2.5) in Chilean (pilot) cities · Mean concentration of CO, SO_x, NO_x in Chilean (pilot) cities · Number of premature mortality and morbidity cases attributed to indoor air pollution

SDG / Category	SDG target	Project impact	Project indicator
SDG 7	7.1: By 2030 ensure universal access to affordable, reliable, and modern energy services 7.2: Increase substantially the share of renewable energy in the global energy mix by 2030 7.3: Double the global rate of improvement in energy efficiency by 2030	· Local wealth retention from greater use of local resources, reduced fossil fuel imports, reduced electricity consumption and more-efficient primary energy consumption as well as improved resilience and energy security at the city level and national level · Increased proportion of population with primary reliance on clean fuels and technology · Increased renewable energy share in the total final energy consumption · Improved consideration of gender in the development of city energy strategy	· Proportion of population with primary reliance on clean fuels and technology in Chilean (pilot) cities · Renewable energy share in the total final heat energy consumption in Chilean (pilot) cities · Primary energy by type in Chilean (pilot) cities
SDG 8	8.3: Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage formalization and growth of micro-, small- and medium-sized enterprises including through access to financial services 8.4: Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation	· Local job creation related to setting up of new district energy projects and increased use of local resources (local forest residues, renewables) · Increase access to affordable and efficient energy for industries and businesses · Enhances productivity for industries and businesses	· Number of employments by DES in Chilean (pilot) cities · Energy intensity measured in terms of primary energy and GDP
SDG 13	13.2: Integrate climate change measures into national policies, strategies and planning	· Substantial contribution to meeting city-wide greenhouse gas reduction targets though the development of District Energy Master Plans. · Master Plans being part of an integrated city policy and strategy, which foster climate resilience and lower greenhouse gas emissions	· Number of municipalities in Chile with newly adopted District energy Master Plan and investment roadmap to develop district energy systems
Technological			

SDG / Category	SDG target	Project impact	Project indicator
SDG 9	9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans-border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all 9.4: By 2030 upgrade infrastructure and retrofit industries to make them sustainable, with increased resource use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, all countries taking action in accordance with their respective capabilities	· Decreased heat loss into the atmosphere, minimizing the heat-island effect in cities · Private sector incorporated with new business opportunities · New employment opportunities · New skills acquired	· Share of households and commercial users connected to DES in Chilean (pilot) cities ·

The pilot cities supported under project will be encouraged to develop an MRV Plan including the sustainable development benefits (incl. socio-economic benefits and global environment benefits). See the section on Monitoring & Evaluation above.

ANNEX A: PROJECT RESULTS FRAMEWORK (either copy and paste here the framework from the Agency document, or provide reference to the page in the project document where the framework could be found).

Project Objective	Objective level Indicators	Baseline	Targets and Monitoring Milestones	Means of Verification	Assumptions & Risks	UNEP MTS reference* / MTS Expected Accomplishment
Accelerate the decarbonisation of the heating sector in Chile by fostering the deployment of district energy systems.	**Indicator:** Number of Chilean cities with district energy investment roadmaps developed and integrated into the city-wide planning cycle (District Energy Master Plan)	**Baseline:** 0	**End of project Target:** up to 3 cities	District Energy Master Plans exist for the cities; city authorities confirm that the roadmap is prepared and considered into their city-wide planning. Funding agreement signed under the National District Energy Financial Support Programme to provide financial support.	Local decision makers and stakeholder are supportive and responsive to implementation of project activities Long-term technical DES potential exists Bankable project will be identified and can be tendered within three years City planning cycle will match with project timelines	MTS: Climate Change Expected Accomplishment: "Countries increasingly adopt and/or implement low greenhouse gas emission development strategies and invest in clean technologies"
Project Outcome	**Outcome Indicators**	**Baseline**	**Targets and Monitoring Milestones**	**Means of Verification**	**Assumptions & Risks**	**UNEP MTS reference* / MTS Expected Accomplishment**

1. Municipalities and private developers plan, develop and promote district energy projects, with the support of the National District Energy Office (NDEO)	**Indicator 1a:** National District Energy Office (NDEO) is established **Indicator 1b:** : Number of municipalities that develop district energy projects	**Baseline 1a:** 0 **Baseline 1b:** 0	**End of project Target 1a:** 1 **End of project Target 1b:** up to 5 cities	National District Energy Office (NDEO) constitution documentation and activity reports Internal NDEO Procedure Guidebook published Open call for project proposals undertaken and projects selected	For establishing the NDEO two suitable qualified national professionals can be hired District energy is suitable in at least 10 Chilean cities and cities are interested in participating in call for proposal It is expected that up to 20 projects apply for support during the duration of the current DES Initiative programme Limited short-term potential for DES at a scale that interests partners or financiers	MTS: Climate Change Expected Accomplishment: “Countries increasingly adopt and/or implement low greenhouse gas emission development strategies and invest in clean technologies”

2. Chile has evidence from the successful tenders to review and calibrate its financial incentive schemes to include district energy	**Indicator 2a:** Number of revised financial schemes **Indicator 2b:** Amount of finance capitalized for district energy and support pilot activities	**Baseline 2a:** 0 **Baseline 2b:** 0	**End of project Target 2a:** 1 **End of project Target 2b:** At least US$ 10,000,000 capitalized and up to three pilot activities are supported	National District Energy Financial Support Programme is established List of up to three high potential pilot projects are selected to receive support from the National District Energy Office Tender documents for the construction and operation of up to 3 pilot projects Letters expressing intention to invest from investors Adoption of district energy investment roadmap by cities with pilot projects	City officials willing to participate in project activities, provide data and necessary information for roadmap development Bankable project will be identified and investment interest secured within three years Sufficient funds are mobilized for the implementation of the pilot projects	

3. Private investor's risk perception on district energy is reduced by incorporating clear guidance on district energy into national and local regulatory frameworks	**Indicator 3a:** Number of technical and planning regulations or standards developed and prepared for adoption at national level **Indicator 3b**: Number of cities with new regulations or policy actions on district energy prepared for adoption	**Baseline 3a:** 0 **Baseline 3b:** 0	**End of project Target 3a:** 2 **End of project Target 3b**: 2 cities	National regulatory framework for district energy drafted and prepared for adoption at national level. Guideline for municipalities on how to incorporate the technical and planning regulations and standards into the local regulatory framework existing. Number of adoptions of new regulations or policy actions on district energy at city / municipality level publicly announced (news, authorities' website etc.)	National authorities and city officials are willing to adopt the new regulations or policy actions	

4. Municipalities and the private sector have the knowledge and capacity to plan, develop and commercialize district energy projects.	**Indicator 4a**: Number of additional requests to the NDEO **Indicator 4b**: Number of people trained in workshops disaggregated by gender	**Baseline 4a:** 0 **Baseline 4b:** 0	**End of project Target 4:** 5 requests **End of project Target 4b**: 50	List of letters of interest and requests from municipalities received by the NDEO Project monitoring and evaluation system, documented outputs: outreach campaign materials, workshop documentations, number and list of participants in workshops and webinars, meeting minutes and website statistics	Cities officials in additional interested in the project and willing to participate in activities such as workshops etc. Project activities are not able to create high awareness of the environmental and financial benefits of the DES and its importance in meeting multiple energy policy objectives.	

ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

All comments were cleared by the GEF secretariat.

ANNEX C: Status of Utilization of Project Preparation Grant (PPG). (Provide detailed funding amount of the PPG activities financing status in the table below:

PPG Grant Approved at PIF: **US$**	
Project Preparation Activities Implemented	***GETF/LDCF/SCCF Amount (US$)***

	Budgeted Amount	*Amount Spent to date*	*Amount Committed*
Staff and consultants	40,000	45,000	
Travel	10,000	5,000	
-			
-			
Total	**50,000**	**50,000**	

ANNEX D: CALENDAR OF EXPECTED REFLOWS (if non-grant instrument is used)

Provide a calendar of expected reflows to the GEF/LDCF/SCCF/CBIT Trust Funds or to your Agency (and/or revolving fund that will be set up)

Not applicable - intentionally left blank.

ANNEX E: Project Map(s) and Coordinates

Please attach the geographical location of the project area, if possible.

The project is focused on the central and southern regions of Chile, from Región Metropolitana to Región de Magallanes y Antártica Chilena. Heating demand in Chile increases from North to South.

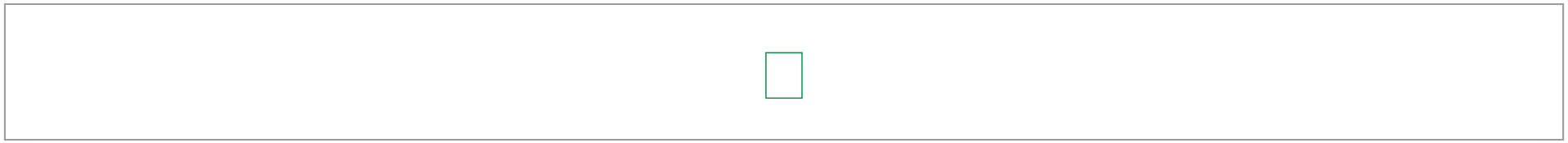
Figure 9: Area of Project implementation in Chile

The work already performed by the District Energy Initiative in cities in Chile has supported 12 cities in the Región Metropolitana, Región del Bío Bío, Región de la Araucanía y Region de Aysén del Gral. Ibañez del Campo and 4 cities in the process of being replication. The coordinates of the projects currently evaluated under the District Energy Initiative in cities are:

Table 9: Supported cities in Chile

City	Region	Latitude	Longitude
Renca	Región Metropolitana	-33.340.636	-70.727.997
Santiago	Región Metropolitana	-33.344.889	-70.669.265
Recoleta	Región Metropolitana	-33.397.207	-70.642.815
Independencia	Región Metropolitana	-33.413.347	-70.666.291
Talcahuano	Región del Bío Bío	-36.724.783	-73.116.981
Hualpén	Región del Bío Bío	-36.786.676	-73.109.953
San Pedro de la Paz	Región del Bío Bío	-36.830.535	-73.116.737
Coronel	Región del Bío Bío	-37.034.077	-73.140.484
Temuco	Región de la Araucanía	-38.735.902	-72.590.374
Coyhaique	Región de Aysén	-45.571.225	-72.068.265

It is expected that up to 10 cities will apply for support to the NDEO under component 1 and will therefore be eligible to receive financial support from the National District Energy Financial Support Programme.



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