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# The rapid assessment of the district heating development in Quinto Burgos, Coyhaique City, Chile

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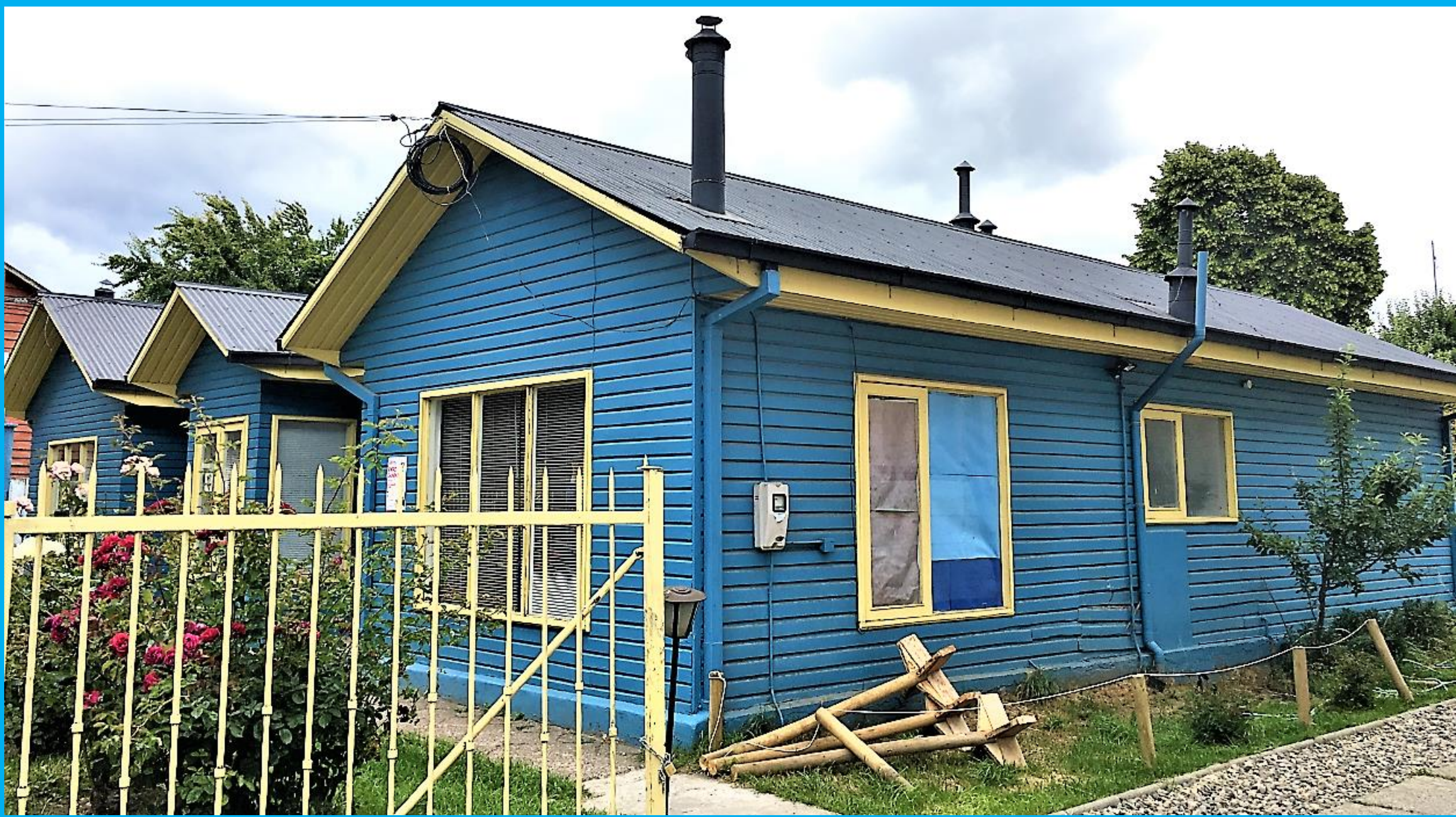

# THE RAPID ASSESSMENT OF THE DISTRICT HEATING DEVELOPMENT IN QUINTO BURGOS, COYHAIQUE CITY, CHILE

REPORT

2020

# Content

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# Background / Context

The District Energy in Cities Initiative is a multi-stakeholder partnership led by UN Environment, with support from Danish International Development Agency, Global Environment Facility (GEF), Kigali Cooling Efficiency Program (K-CEP) and the Italian Ministry of Environment, Land and Sea. The initiative is one of the six accelerators of the Global Energy Efficiency Accelerator Platform launched under the United Nations' Sustainable Energy for ALL (SE4ALL) program, and aims at doubling the rate of energy efficiency improvements for heating and cooling in buildings by 2030. This will help countries to meet their climate change and sustainable development targets. Chile is a pilot country of this Initiative, coordinated nationally by UNEP and Chile national and local government representatives.

The air pollution in Chile every year costs over 600 million USD to the health sector, being the main cause of the 127,000 emergency health visits and more than 4,000 premature deaths. In some Chilean urban areas, 94% of air pollution comes from wood burning for heating in single one family homes. In winter time the levels of Particulate Matter (PM2.5 and PM10) exceed the threshold of emissions established by the Chile country government, also the measured Particulate Matter by 24-hour mean and annual mean values are much higher than defined by the World Health Organisation (WHO) 2005 guideline. Burning high moisture content firewood in woodstoves also results in emissions of formaldehydes and methane, another strong Near-term Climate Forcer with a GWP10=105 and a GWP100=28, then combustion in District Heating scenarios results in only minor emissions of methane. Due to its direct impact on health, the Chile country was actively looking into alternative technologies capable of tackling the problem and improving the quality of life for the citizens living in these highly polluted cities. To tackle air pollution problem, the Chile government has banned high pollutant heaters and has taxed vehicles with the so-call "Green Tax" which is paid according the car price tag.

The potential for acceleration of district energy in Chile can be described as very good. National and local governments, government agencies and individuals are motivated by a shared sense of urgency, knowing that current energy sources cause significant human suffering. The coordination of activities towards climate mitigation in Chile are of two levels - National and Local government. This interaction of National and Local governments in Chile are very close, making facilitation of the projects even more favourable. The Ministry of Environment has already collected extensive data regarding the sources and historical levels of air pollution.

# I. SUMMARY OF MAIN RESULTS

Rapid Assessment of Quinto Burgos district area of Coyhaique City, Chile shows that the District Heating technology is technically and economically viable in Coyhaique City. The selected Quinto Burgos area with **523 residential** one family and **13 non-residential** buildings with total 98.090 $m^2$ heated area may require **9 MW installed capacity** for premises heating and hot water preparation and will consume **9.000 $m^3$ of biomass** to produce **25 GWh of heat energy** annually.

The District Heating implementation will require **11.8 mln. Eur. investment**. Taking into consideration 25 years project duration with 10 years debt to cover 100% of CAPEX, assuming 2% interest rate, 2% discount rate, the assessment of Internal Rate of Return shows **IRR=17%** and the assessment of Net Present Value shows **NPV=3'316'431,** the **NPV= 0** is at 10 years.

The financial sensitivity analysis shows, that the heat energy price in Quinto Burgos district area of Coyhaique City may vary **from 0.038 to 0.060 Eur/kWh** depending on the subsidies level and debt size/period. Financial assessment shows that bringing private partner willing to invest into the project, makes heat energy price smaller and more attractive for the consumer, therefore Public Private Partnership model is recommended. The subsidies to the project also makes a great influence to the final heat energy price for the consumer.

The environmental assessment shows that biomass based District Heating technology will reduce PM 2.5 and PM10 **particulates to almost 0 level** and **will save 11.000 t $CO_2$/y**.

# 2. ASSESSMENT OF CLIMATIC DATA

The climatic data makes a big influence into to the design of the District Heating Systems. It appears because one heating season may be very short but cold, another very long but worm, third short with moderate outside air temperature and etc. So the influencing factors as outside air temperature and the duration of heating season should be eliminated for the design of the District Heating Systems. The inside air temperature also plays important role, as there may be a big difference up to which temperature the premises should be heated.

The climatic data of Coyhaique City, Chile have been assessed for the calculations. The climatic data shows that Coyhaique relatively to the other cities in Chile has cold and long heating season with +5.8oC average outside air temperature, -11.0oC design outside air temperature, 275 heating days and 3.365 annual Degree Days.

Table 2.1. Climatic outside temperature data.

| No. | Year | Month | Min T °C | Average T °C |
|---|---|---|---|---|
| 1 | 2017 | 3 | 1 | 11 |
| 2 | 2017 | 4 | -3 | 7 |
| 3 | 2017 | 5 | -2 | 5 |
| 4 | 2017 | 6 | -10 | 1 |
| 5 | 2017 | 7 | -15 | 3 |
| 6 | 2017 | 8 | -4 | 4 |
| 7 | 2017 | 9 | -2 | 6 |
| 8 | 2017 | 10 | 0 | 8 |
| 9 | 2017 | 11 | No data | 10 |
| 10 | 2018 | 3 | -3 | 10 |
| 11 | 2018 | 4 | -4 | 8 |
| 12 | 2018 | 5 | -4 | 5 |
| 13 | 2018 | 6 | -11 | 1 |
| 14 | 2018 | 7 | -9 | 1 |
| 15 | 2018 | 8 | -5 | 4 |
| 16 | 2018 | 9 | -3 | 6 |
| 17 | 2018 | 10 | -2 | 8 |
| 18 | 2018 | 11 | No data | 9 |
| | | | **-11,0** | **5,8** |

Table 2.2. Climatic Degree Days data.

| No. | Base temperature, oC | Number of heating days | Number of Degree Days |
|---|---|---|---|
| 1 | 18 | 275 | 3'365 |
| 2 | 21 | 275 | 5'775 |

# 3. DEMAND SIDE ASSESSMENT

The design of a potential District Heating Network and Thermal Power Plant for a mixed residential and commercial area in Quinta Burgos, Coyhaique is presented. The applied methodology utilise a bottom-up approach and consists of identifying the existing buildings in the area and calculating the energy demands for heating and domestic hot water, and then designing the appropriate District Heating System.

The demand side of the selected Quinto Burgos district area of Coyhaique City, Chile, is characterised by 523 residential one family and 13 non-residential buildings, with total 98.090 m$^2$ heated area of all 536 buildings. The buildings are described in Tables 3.1 and 3.2.

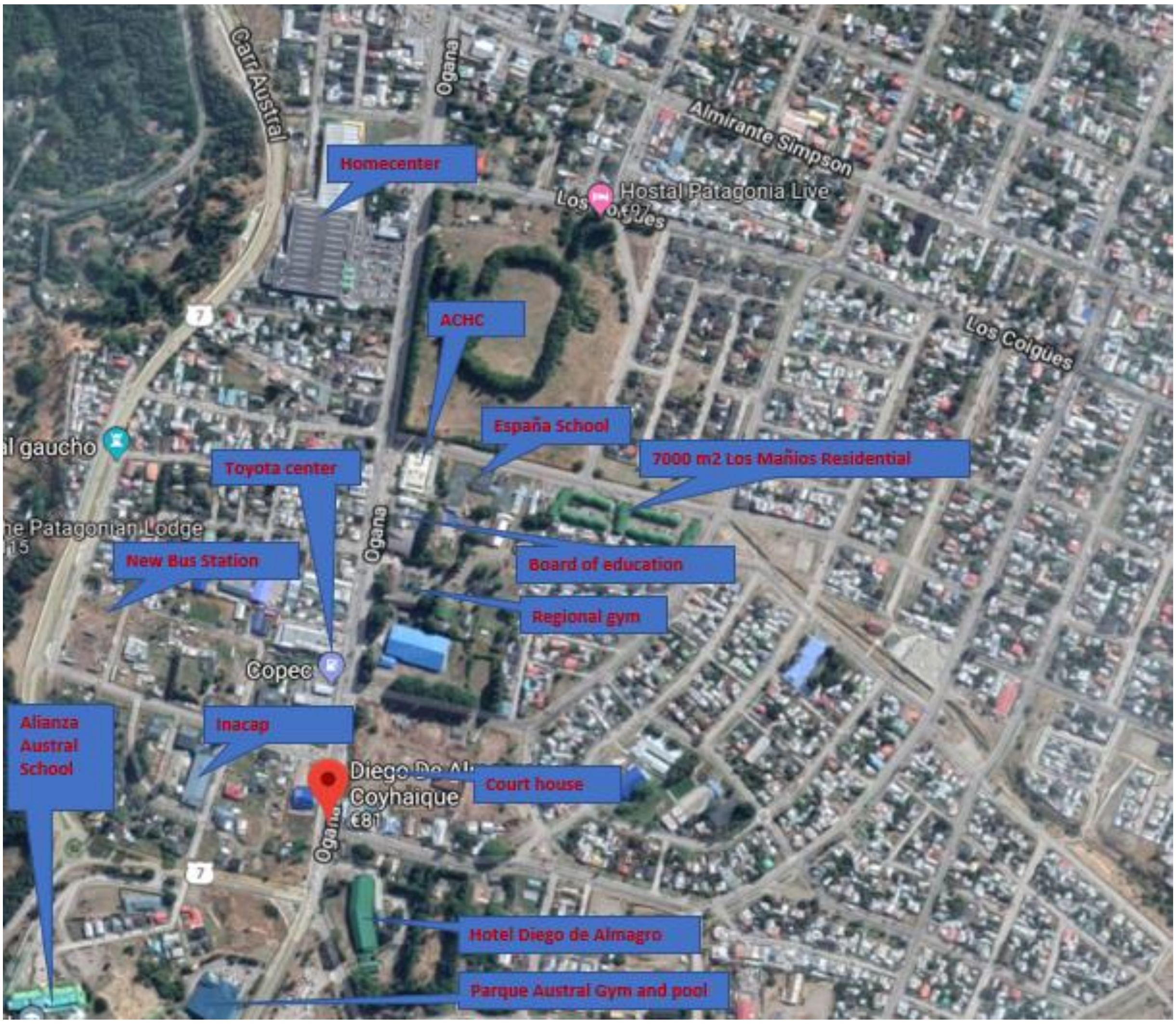
Table 3.1. Non-residential buildings.

| No. | Customer | Sector of Activity | Total surface m² | Number on buildings |
|---|---|---|---|---|
| 1 | Alianza Austral School | Education | 3'916 | 1 |
| 2 | Hotel Diego de Almagro | Housing | 5'964 | 1 |
| 3 | INACAP | Education | 4'370 | 1 |
| 4 | Board of education | Office | 1'073 | 1 |
| 5 | ACHS | Office | 2'010 | 1 |
| 6 | Toyota | Commercial | 1'768 | 1 |
| 7 | Homecenter | Commercial | 10'285 | 1 |
| 8 | New bus terminal | Commercial | 1'545 | 1 |
| 9 | Parque Austral Gym and pool | Health | 2'500 | 1 |
| 10 | Regional gym | Health | 1'333 | 1 |
| 11 | España School | Education | 4'984 | 1 |
| 12 | Los Mañios Building | Housing | 7'000 | 1 |
| 13 | Courthouse | Office | 9'200 | 1 |
| | | **Total** | **55'948** | **13** |

Table 3.2. Residential buildings.

| No. | Customer | Sector of Activity | Total surface m² | Number on buildings |
|---|---|---|---|---|
| 1 | Residential one family individual house | Residential | 84 | 453 |
| 2 | Residential one family individual house | Residential | 57 | 70 |
| | | **Total** | **42'142** | **523** |

Described consumers utilise heat energy in these buildings for premises heating and hot water preparation and can be characterised by 9 MW peak capacity and annual 9.000 m³ biomass consumption for 25 GWh annual heat energy production.



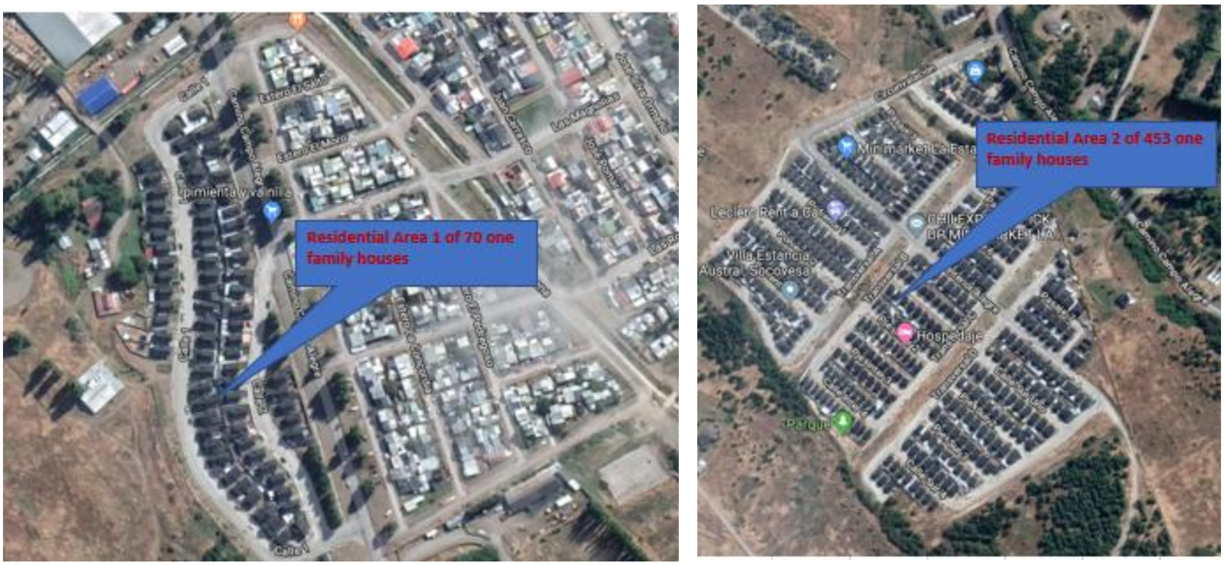



Figure 3.1. The location of District Heating Consumers.

# 4. DISTRICT HEATING NETWORK AND POWER PRODUCTION ASSESSMENT

The modern 4th Generation Low Temperature District Heating Network (4GDH) is designed. Low Temperature network gives a possibility to utilise modern plastic district heating network pipes. To connect selected District Heating consumers in Quinto Burgos area is necessary to install 16 km of underground pipe network (6 km for residential one family buildings and 10 km for non-residential buildings). To connect the buildings to the District Heating Network, the heat substations should be installed in every building. Total investment for the District Heating Network and heat substations in buildings requires 3.7 mln. Eur.

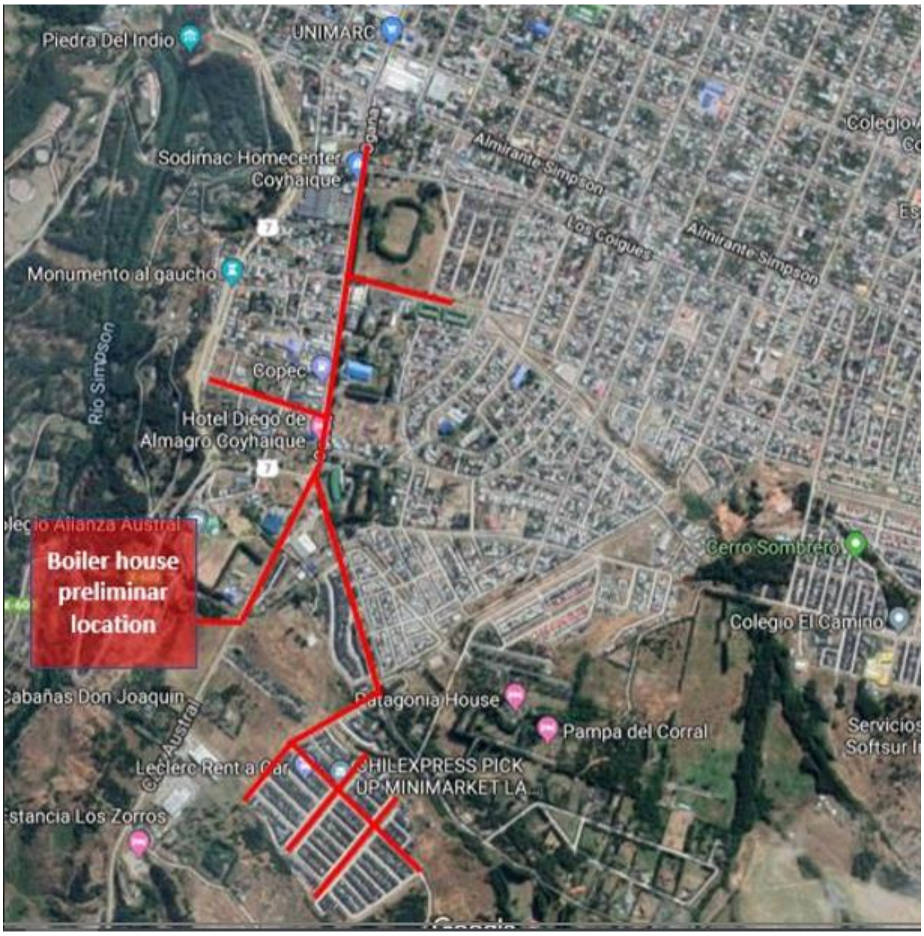



Figure 4.1. District Heating Network main pipelines.

To supply heat to consumers in Quinto Burgos area is necessary to install 9 MW biomass boilers (5MW+2MW+2MW) with initial 8.1 mln. Eur. investment.

# 5. FINANCIAL ASSESSMENT

The financial assessment of Quinto Burgos district area of Coyhaique City, Chile shows that the project requires initial **11.8 mln. Eur. investment** and 0.7 mln. Eur annual operational and fuel costs,

Table 5.1. CAPEX

| No | CAPEX, Eur | Total |
|---|---|---|
| 1 | Power production CAPEX | 8'100'001 |
| 2 | District Heating Network CAPEX | 3'734'979 |
| | **TOTAL CAPEX:** | **11'834'980** |

Table 5.2. OPEX and fuel costs.

| No | OPEX, Eur | Total |
|---|---|---|
| 1 | Power production OPEX | 387'567 |
| 2 | District Heating Network OPEX | 75'184 |
| 3 | Fuel costs | 284'578 |
| | **TOTAL OPEX:** | **747'329** |

The District Heating in Quinto Burgos district area of Coyhaique City, Chile can be developed with/without any subsidies and with/without debt to cover the investment.

Taking into consideration 25 years project duration with 10 years debt to cover 100% of CAPEX, assuming 2% interest rate, 2% discount rate, the assessment of Internal Rate of Return shows **IRR=17%**. The project under investigation has the IRR > Cost of capital, therefore the project is commercially successful and is recommended to be implemented into practice.

The assessment of Net Present Value for the same 25 years project duration with 10 years debt to cover 100% of CAPEX, assuming 2% interest rate, 2% discount rate shows **NPV=3'316'431,** the **NPV= 0** is at 10 years. The project under investigation has NPV > 0, therefore the project is commercially successful and is recommended to be implemented into practice.

The financial sensitivity analysis shows, that the heat energy price in Quinto Burgos district area of Coyhaique City may vary from 0.038 to 0.060 Eur/kWh depending on the subsidies level and debt size/period. Implementing the project with 50% subsidies the heat energy price is **smallest and equal to 0.038 Eur/kWh**, the heat energy price without any subsidies and debt for the investment **makes 0.047 Eur/kWh** and implementing this project for 25 years duration with 10 years debt to cover 100% of CAPEX brings some additional costs to cover interest expenses, income/profit tax, etc.), therefore taking into consideration all main costs, the heat energy price for the final consumer may increase to **0.06 Eur/MWh**. Financial assessment shows that bringing private partner willing to invest into the project, makes heat energy price smaller and more attractive for the consumer. The subsidies to the project also makes a great influence to the final heat energy price for the consumer.

Table 5.3. Heat energy price depending on the subsidies and debt level.

| No | Project | Financial instruments | Heat energy price, Eur/MWh |
|---|---|---|---|
| 1. | District Heating, no debt | 0% subsidies | 0,047 |
| 2. | District Heating, no debt | 25% subsidies | 0,043 |
| 3. | District Heating, no debt | 50% subsidies | 0,038 |
| 4. | District Heating, no subsidies | 10 years debt for 100% CAPEX | 0,060 |
| 5. | District Heating, no subsidies | 10 years debt for 50% CAPEX | 0,045 |

Table 5.3. Debt Service Account.

| | | |
|---|---|---|
| | Project duration, years | 25 |
| | Debt period, years | 10 |

| No. | Project year | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Interest rate | | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 | | | | | | | | | | | | | | | | |
| 2. | **CAPEX, Eur** | **11'834'980** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | |
| 2.1. | Power Generation costs, Eur | 8'100'001 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.2. | District Heating Network costs, Eur | 2'558'979 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.3. | Heat Substations costs, Eur | 1'176'000 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.4. | Buildings Internal Heating System costs, Eur | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | **Opening balance, Eur** | | **11'834'980** | **10'754'132** | **9'651'667** | **8'527'154** | **7'380'150** | **6'210'205** | **5'016'862** | **3'799'652** | **2'558'098** | **1'291'713** | | | | | | | | | | | | | | | | |
| 4. | Repayment of Principal, Eur | | 1'080'848 | 1'102'465 | 1'124'514 | 1'147'004 | 1'169'944 | 1'193'343 | 1'217'210 | 1'241'554 | 1'266'385 | 1'291'713 | | | | | | | | | | | | | | | | **11'834'980** |
| 5. | Closing balance, Eur | | 10'754'132 | 9'651'667 | 8'527'154 | 7'380'150 | 6'210'205 | 5'016'862 | 3'799'652 | 2'558'098 | 1'291'713 | 0 | | | | | | | | | | | | | | | | |
| 6. | Interest payment, Eur | | 236'700 | 215'083 | 193'033 | 170'543 | 147'603 | 124'204 | 100'337 | 75'993 | 51'162 | 25'834 | | | | | | | | | | | | | | | | **1'340'492** |
| 7. | **Total Debt Service, Eur** | | **1'317'547** | **1'317'547** | **1'317'547** | **1'317'547** | **1'317'547** | **1'317'547** | **1'317'547** | **1'317'547** | **1'317'547** | **1'317'547** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **13'175'472** |

Table 5.4. Cash Flow Statement

| | | |
|---|---|---|
| | Project duration, years | 25 |
| | Debt period, years | 10 |
| | Profit, % from CAPEX | 2,0 |

| No. | Project year | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | **Operating revenues, Eur** | **0** | **2'337'081** | **2'337'081** | **2'337'081** | **2'337'081** | **2'337'081** | **2'337'081** | **2'337'081** | **2'337'081** | **2'337'081** | **2'337'081** | **1'019'534** | **1'019'534** |
| | Cumulative operating revenues, Eur | | 2'337'081 | 4'674'162 | 7'011'242 | 9'348'323 | 11'685'404 | 14'022'485 | 16'359'566 | 18'696'646 | 21'033'727 | 23'370'808 | 24'390'342 | 25'409'875 |
| 2. | **Operating costs, Eur** | **0** | **747'329** | **747'329** | **747'329** | **747'329** | **747'329** | **747'329** | **747'329** | **747'329** | **747'329** | **747'329** | **747'329** | **747'329** |
| 2.1. | Fuel, Eur | 0 | 284'578 | 284'578 | 284'578 | 284'578 | 284'578 | 284'578 | 284'578 | 284'578 | 284'578 | 284'578 | 284'578 | 284'578 |
| 2.2. | Land lease, Eur | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2.3. | Opex, Eur | 0 | 462'751 | 462'751 | 462'751 | 462'751 | 462'751 | 462'751 | 462'751 | 462'751 | 462'751 | 462'751 | 462'751 | 462'751 |
| 2.3.1. | Power Generation costs, Eur | 0 | 387'567 | 387'567 | 387'567 | 387'567 | 387'567 | 387'567 | 387'567 | 387'567 | 387'567 | 387'567 | 387'567 | 387'567 |
| 2.3.2. | District Heating Network costs, Eur | 0 | 75'184 | 75'184 | 75'184 | 75'184 | 75'184 | 75'184 | 75'184 | 75'184 | 75'184 | 75'184 | 75'184 | 75'184 |
| 2.3.3. | Heat Substations costs, Eur | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2.3.4. | Buildings Internal Heating System costs, Eur | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3. | **Total Debt Service, Eur** | **0** | **1'317'547** | **1'317'547** | **1'317'547** | **1'317'547** | **1'317'547** | **1'317'547** | **1'317'547** | **1'317'547** | **1'317'547** | **1'317'547** | **0** | **0** |
| 3.1. | Repayment of Principal (Capex), Eur | 0 | 1'080'848 | 1'102'465 | 1'124'514 | 1'147'004 | 1'169'944 | 1'193'343 | 1'217'210 | 1'241'554 | 1'266'385 | 1'291'713 | 0 | 0 |
| 3.2. | Interest payment, Eur | 0 | 236'700 | 215'083 | 193'033 | 170'543 | 147'603 | 124'204 | 100'337 | 75'993 | 51'162 | 25'834 | 0 | 0 |
| 4. | **Profit before interest and taxes, Eur** | **0** | **508'904** | **487'287** | **465'238** | **442'748** | **419'808** | **396'409** | **372'542** | **348'198** | **323'366** | **298'039** | **272'205** | **272'205** |
| 4. | **Income tax, 15%** | | **35'505** | **35'505** | **35'505** | **35'505** | **35'505** | **35'505** | **35'505** | **35'505** | **35'505** | **35'505** | **35'505** | **35'505** |
| 4. | **Profit after interest and taxes, Eur** | **0** | **236'700** | **236'700** | **236'700** | **236'700** | **236'700** | **236'700** | **236'700** | **236'700** | **236'700** | **236'700** | **236'700** | **236'700** |

| No. | Project year | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | **Operating revenues, Eur** | **1'019'534** | **1'019'534** | **1'019'534** | **1'019'534** | **1'019'534** | **1'019'534** | **1'019'534** | **1'019'534** | **1'019'534** | **1'019'534** | **1'019'534** | **1'019'534** | **1'019'534** | **38'663'812** |
| | Cumulative operating revenues, Eur | 26'429'409 | 27'448'942 | 28'468'476 | 29'488'010 | 30'507'543 | 31'527'077 | 32'546'610 | 33'566'144 | 34'585'678 | 35'605'211 | 36'624'745 | 37'644'279 | 38'663'812 | |
| 2. | **Operating costs, Eur** | **747'329** | **747'329** | **747'329** | **747'329** | **747'329** | **747'329** | **747'329** | **747'329** | **747'329** | **747'329** | **747'329** | **747'329** | **747'329** | **18'683'227** |
| 2.1. | Fuel, Eur | 284'578 | 284'578 | 284'578 | 284'578 | 284'578 | 284'578 | 284'578 | 284'578 | 284'578 | 284'578 | 284'578 | 284'578 | 284'578 | 7'114'448 |
| 2.2. | Land lease, Eur | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2.3. | Opex, Eur | 462'751 | 462'751 | 462'751 | 462'751 | 462'751 | 462'751 | 462'751 | 462'751 | 462'751 | 462'751 | 462'751 | 462'751 | 462'751 | **11'568'779** |
| 2.3.1. | Power Generation costs, Eur | 387'567 | 387'567 | 387'567 | 387'567 | 387'567 | 387'567 | 387'567 | 387'567 | 387'567 | 387'567 | 387'567 | 387'567 | 387'567 | 9'689'185 |
| 2.3.2. | District Heating Network costs, Eur | 75'184 | 75'184 | 75'184 | 75'184 | 75'184 | 75'184 | 75'184 | 75'184 | 75'184 | 75'184 | 75'184 | 75'184 | 75'184 | 1'879'594 |
| 2.3.3. | Heat Substations costs, Eur | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2.3.4. | Buildings Internal Heating System costs, Eur | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3. | **Total Debt Service, Eur** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **13'175'472** |
| 3.1. | Repayment of Principal (Capex), Eur | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11'834'980 |
| 3.2. | Interest payment, Eur | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1'340'492 |
| 4. | **Profit before interest and taxes, Eur** | **272'205** | **272'205** | **272'205** | **272'205** | **272'205** | **272'205** | **272'205** | **272'205** | **272'205** | **272'205** | **272'205** | **272'205** | **272'205** | **8'145'606** |
| 4. | **Income tax, 15%** | **35'505** | **35'505** | **35'505** | **35'505** | **35'505** | **35'505** | **35'505** | **35'505** | **35'505** | **35'505** | **35'505** | **35'505** | **35'505** | **887'623** |
| 4. | **Profit after interest and taxes, Eur** | **236'700** | **236'700** | **236'700** | **236'700** | **236'700** | **236'700** | **236'700** | **236'700** | **236'700** | **236'700** | **236'700** | **236'700** | **236'700** | **5'917'490** |

# 6. ENVIRONMENTAL ASSESSMENT

The switching from the inefficient individual heating to District Heating in Quinto Burgos district area of Coyhaique City, Chile employing biomass will reduce PM 2.5, PM10, $CO_2$ and other GHG. The utilisation of biomass based District Heating with efficient filtering technologies may reduce 95% of **PM particulates to almost 0 level**, and annually save 6.500 t of $CO_2$ due to increased efficiency. Taking into consideration biomass based technology as carbon-neutral, the **annual $CO_2$ savings makes 11.000 t**.

# 7. DEVELOPMENT OF THE BUSINESS MODEL AND PLAN

A significant amount of capital investment is necessary for the District Heating development in Chile. However, the investments in District Heating at local level bring benefits to society as a whole that not always can be fully reflected in investment returns, what may lead to underinvestment by the private sector. Besides, the operation of District Heating require strengthened management and expertise for operations which the National and Local Government in Chile may not have. As seen from the international experiences worldwide, the business models for District Heating in many cases involve the government's partial or full ownership of the project.

THE "WHOLLY PUBLIC" BUSINESS MODEL. The public sector, in its role as local authority or public utility, has full ownership of the system, which allows it to have complete control of the project and makes it possible to deliver broader social objectives, such as environmental outcomes and the alleviation of fuel poverty through tariff control.

HYBRID PUBLIC AND PRIVATE" BUSINESS MODELS. "Hybrid Public and Private" business models have a rate of return that will attract the private sector, but the public sector is still willing to invest in the project and retain some control. These business models can be a public and private joint venture where investment is provided by both parties that are creating a district energy company, or where the public and private sector finances different assets in the district energy system. A concession contract where the public sector is involved in the design and development of a project, which is then developed, financed and operated by the private sector, and the city usually has the option to buy back the project in the future, is well known in the Chile.

PRIVATE" BUSINESS MODELS. "Private" business models are pursued where there is a high rate of return for the private sector, and require limited public sector support. They are developed as a wholly privately owned Special Purpose Vehicle but may benefit from guaranteed demand from the public sector or a subsidy or local incentives.

The most attractive Business Model for the District Heating development in Quinto Burgos area of Coyhaique City, Chile is PPP - Public Private Partnership, then the local government still keep the control of the utility property and the private sector brings the finances and know-how of District Heating development, installation, operation and maintenance. Many projects in Chile are driven by the Concession agreement, so the Concession is also considerable scenarios for the further District Heating development.

UN environment programme

DISTRICT ENERGY IN CITIES INITIATIVE

UNEP DTU PARTNERSHIP

UNEP DTU PARTNERSHIP

# Rapid Assessment Methodology for the District Heating Development in Chile

2020

https://unepdtu.org/