

# GRID BASED ENERGY SYSTEM SETUP OPTIMISATION WITH RIVUS IN DEDICATED REGIONS

ISEC 2018

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# Summary

- Introduction
- Methodology
  - Energy demand
  - Network
  - Objective & Constraints
- Scenarios Feltre & Seeham
- Results
- Conclusions

## Introduction

- Situation / Grid based energy system:
  - District Heating Systems can be part of the **decarbonisation**
  - District Heat needs to improvement to **4th generation**
  - District Heat Network **differ** from place to place
- Attainment:
  - Combination of **Mixed Integer Linear Programming** & **Geographic Information Systems**

## Methodology

- Estimating energy demand - Feltre

- $QH, nd = (QH, tr + QH, ve) - \eta H, gn(Qin + Qsol)$

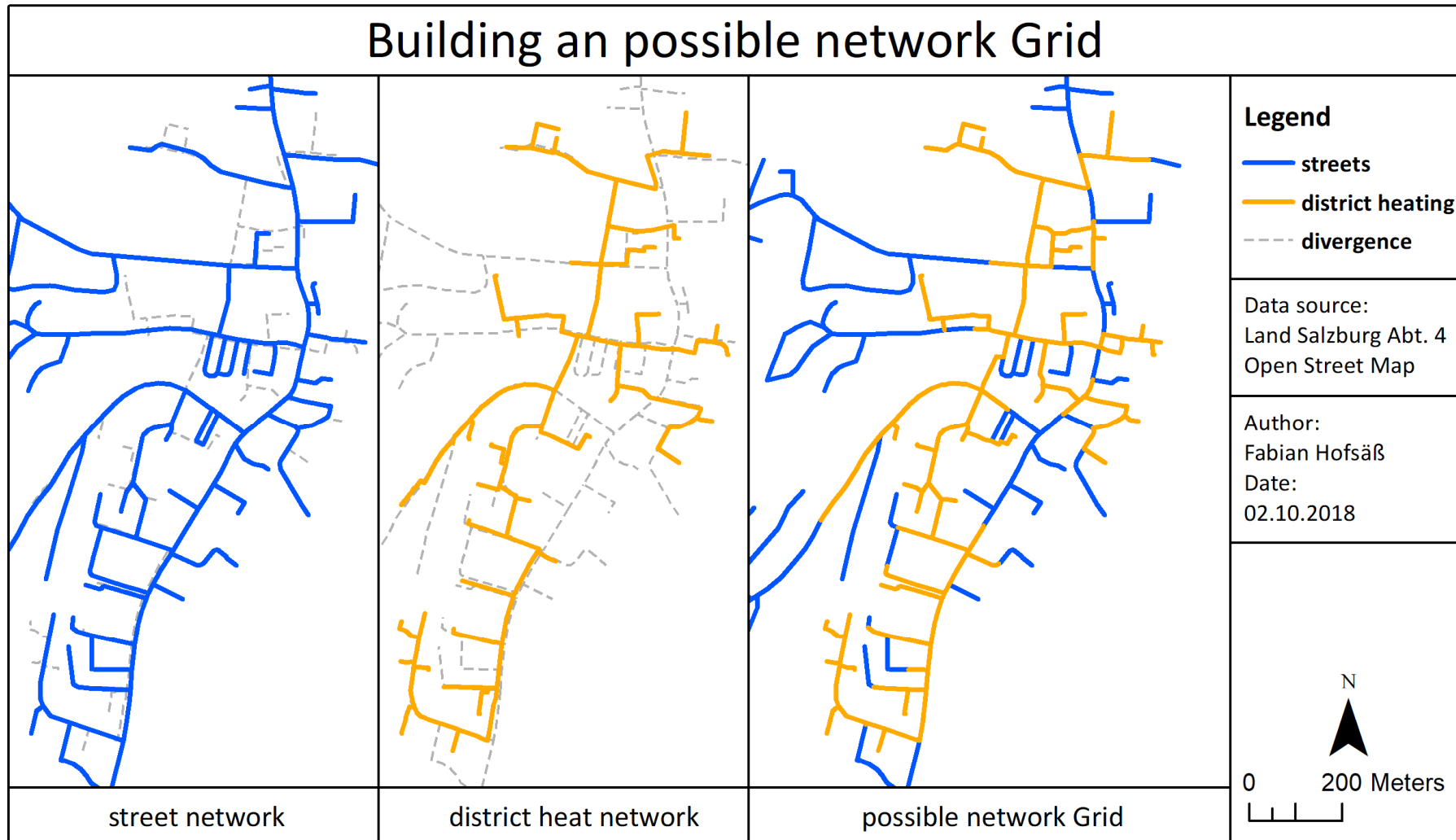
- For more Information – Poster Session:

- A bottom-up methodology for buildings energy demand calculation to support grid based energy systems in urban areas
    - Tiziano Dalla Mora / Steiermark Hall 3:30 pm until 4:40 pm

- Estimating energy demand – Seeham

- $QH = CN_{AGE, Typ} * GFA$

# Methodology



## Methodology

- Objective:

- $\Sigma \text{cost} = \Sigma \text{inv} + \Sigma \text{fix} + \Sigma \text{var}$

- Constraints:

- **All Building demands** have to be fulfilled

- At all time
    - At all scale

- ...

- Option:

- **Limitation** of Carbon dioxide equivalents / **CO<sub>2</sub>eq**

## Scenarios

<b>Region</b>	Feltre	Seeham
<b>District Heat</b>	-	Installed
<b>Individual Supply</b>	Gas	Electricity
<b>Optional Supply</b>	Waste Heat recovery District Heat (limited)	-
<b>Scenarios</b>	80% & 60% CO <sub>2</sub> eq	
<b>Special</b>	-	Base Scenario ~ Status quo

Basic

80% CO2

60% CO2



**district heating network [kW]**

- $\leq 100$
- $100 \leq 200$
- $200 \leq 400$
- $\geq 400$

**miscellaneous**

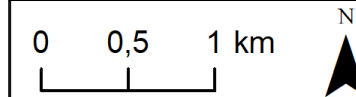
- heat source
- advanced Grid
- buildings
- system boundary

data source:

- city administration database
- cadaster data

Author: Fabian Hofsäß

date: 24.07.2018

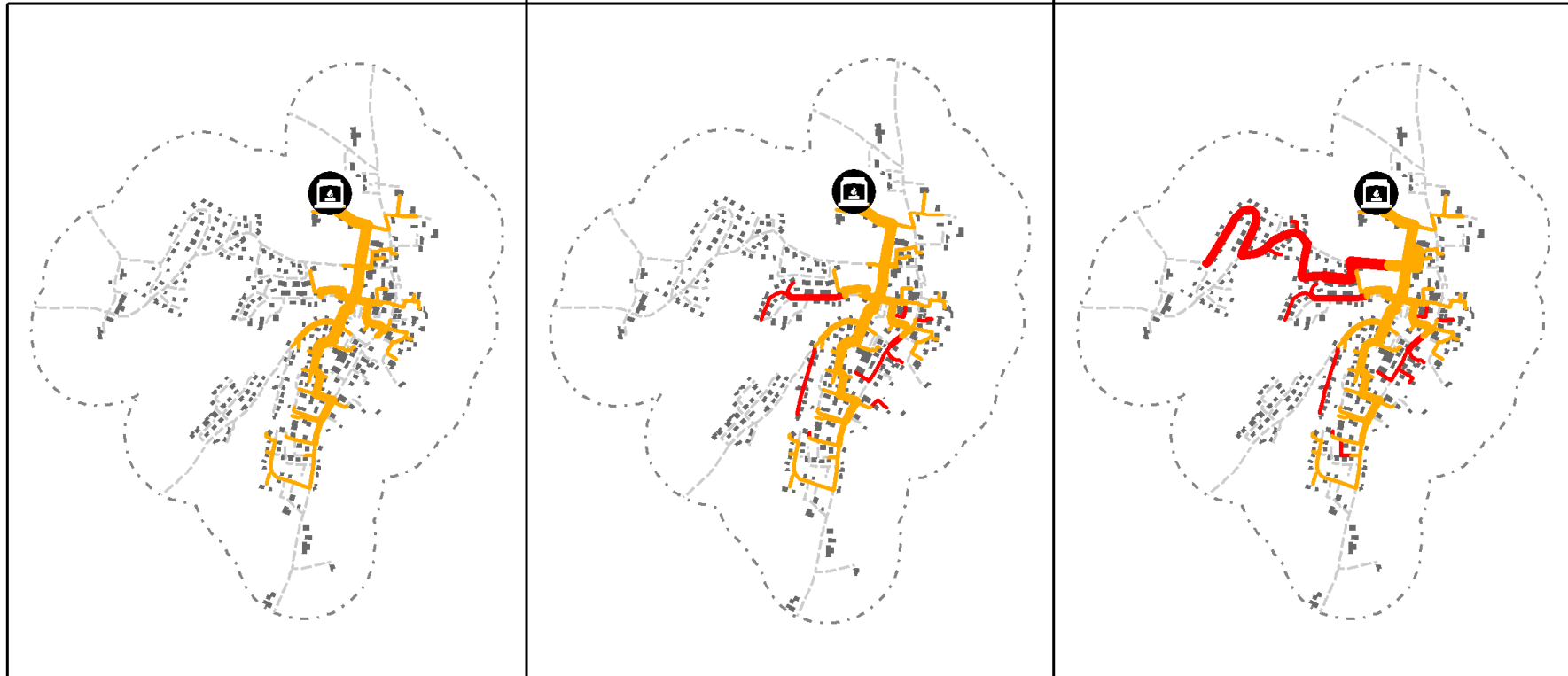




Basic

80% CO2

60% CO2



**district heating network [kW]**

**current**

- <= 100
- 100 <= 200
- 200 <= 400
- > 400

**optimized**

- <= 100
- 100 <= 200
- 200 <= 400
- >= 400

**miscellaneous**

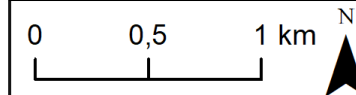
- heat source
- advanced Grid
- buildings
- system boundary

data source:

- Land Salzburg Abt. 4
- Open Street Map

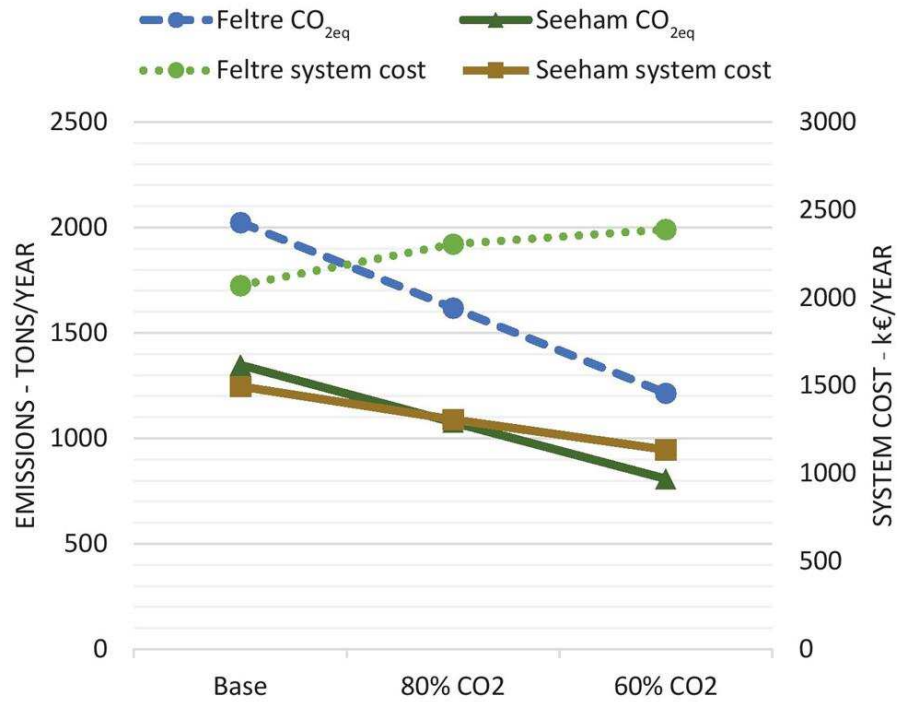
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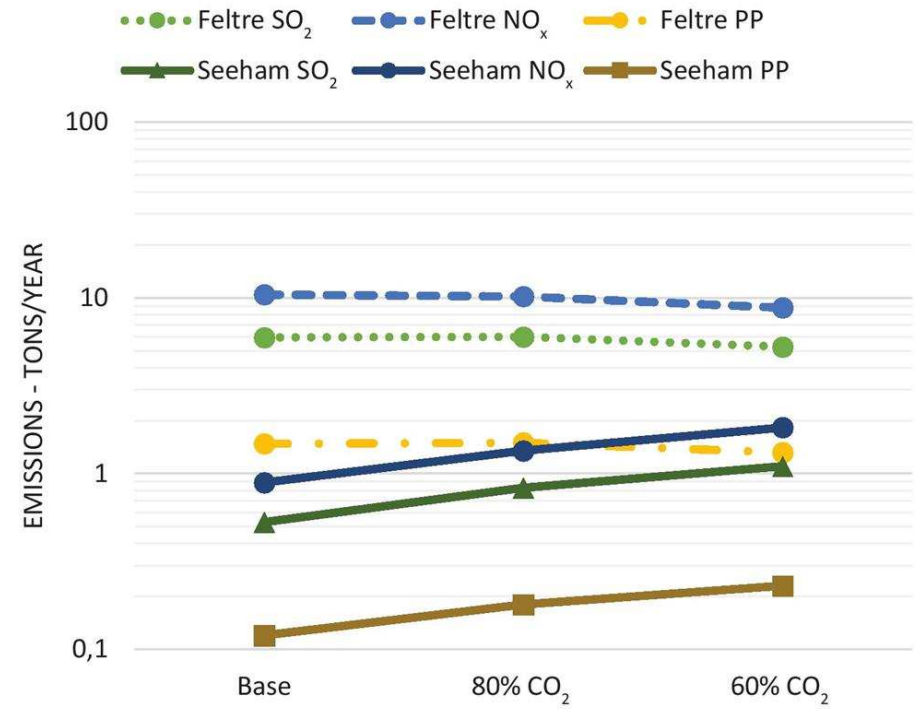


# Result

CO<sub>2</sub> emissions and system cost



Emissions



## Conclusions

- **MILP & GIS**
  - **Topology** of optimal pipe setup
  - Temporal **loads** of pipes
  - **CO<sub>2</sub>** Emission reduction
- Feltre: **Increase** of system cost
- Seeham: **Decrease** of system cost, **increase** of other pollutants
- IDEE Project: Further work in enlarging **Input Data sets**, developing **Constraints** and **Web** based user interface

**Interreg**  
Italia-Österreich  
European Regional Development Fund



**Thank you! Grazie! Danke!**

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