



# Casanova Bolzano: High comfort, low energy

Ing. Marco Castagna



# Casanova, a low energy quarter

## AGENDA

1. Introduction
2. Energy sustainability
3. Mobility sustainability
4. Water sustainability
5. Activities in the framework of the SEE
6. Actual status



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# The Province of South Tyrol

- Population: 490.000;
- Area: 7.400 km<sup>2</sup> , 42% wood;
- Annual average temperature:  
12°C Bolzano (260 m),  
5,5°C Dobbiaco (1.250 m);
- Sunny days a year: 300 - 315;
- Average wind speed: 1-2 -> 5-7 m/s;

## Energy efficiency in South Tyrol

- KlimaHaus - CasaClima: Energy certification for buildings, introduced on voluntary basis in 2002, obligatory for new buildings in 2005

## Renewable Energies in South Tyrol

- 700 Hydro power plants;
- 4000 small biomass heating plants (20 - 100 kW);
- 30 biomass district heating plants (0.8 - 34 MW);
- 0.33 m<sup>2</sup> per capita of solar thermal collectors;



# The Province of South Tyrol



*Source: P.P. Mariotti*

- 45% of energy needs of the Province comes from renewable energies (excluding traffic)

  
**TARGET**

- 75% of energy needs from renewable energies by 2012 (excluding traffic)
- 100% of energy needs from renewable energies by 2020 (excluding traffic)



# Urban planning approach

The CasaNova project aimed at

- Satisfying the need of social housing;
- Ensuring quality and efficiency of the urban processes;
- Enhancing environmental performance;
- Implementing a model settlement with high quality of life and valorisation of the suburbia;

For the quarter of CasaNova the city of Bolzano followed an unusual approach:

- The municipality bought the land and could thus influence more directly the urban planning process;
- Architectural competition on European level for the urban concept;
- Detailed master plan (including restrictive guidance on energetic performance, mobility & water management);



# Frits van Dongen's urban concept

The master plan sought the dialogue between city and surrounding countryside and tried to create optimal conditions for the creation of micro-communities.



“The district will gently and discreetly enter among the orchards, as if the landscape would tenaciously retain its imprint on the territory” [Frits van Dongen]



# The quarter CasaNova

- The district is under construction in the south of Bolzano, northbounded by an existing district, the Ortles-Similaum, and in the south by the railway line;
- The urban concept from the Van Dongen group won the architectural competition on European level;
- The district consists of 8 groups buildings embracing a total of 950 apartments and will provide housing for approx. 3000 persons;





# Sustainability

This is a sustainable district from 3 points of view:

- Energy
- Mobility
- Water



# Casanova, a low energy quarter

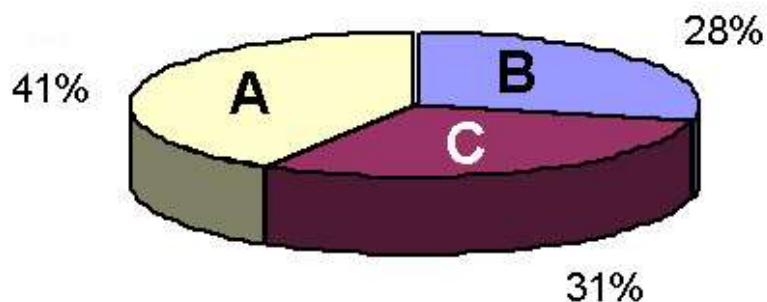
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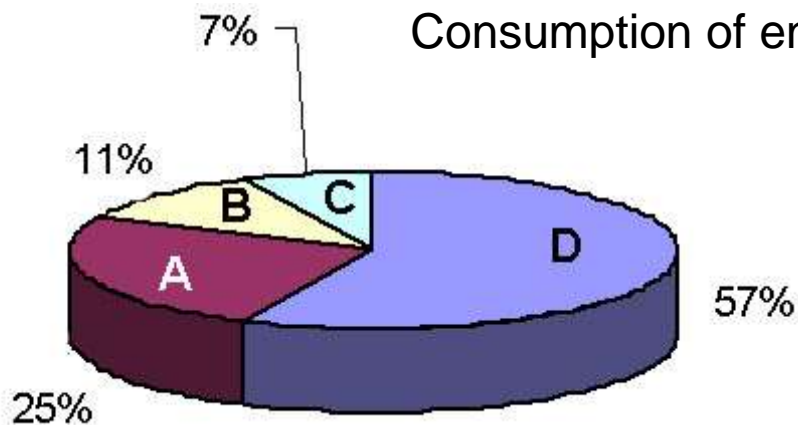
# The energy impact of buildings

Energy consumption in Italy differentiated by sectors



- A Building
- B Industry
- C Transport

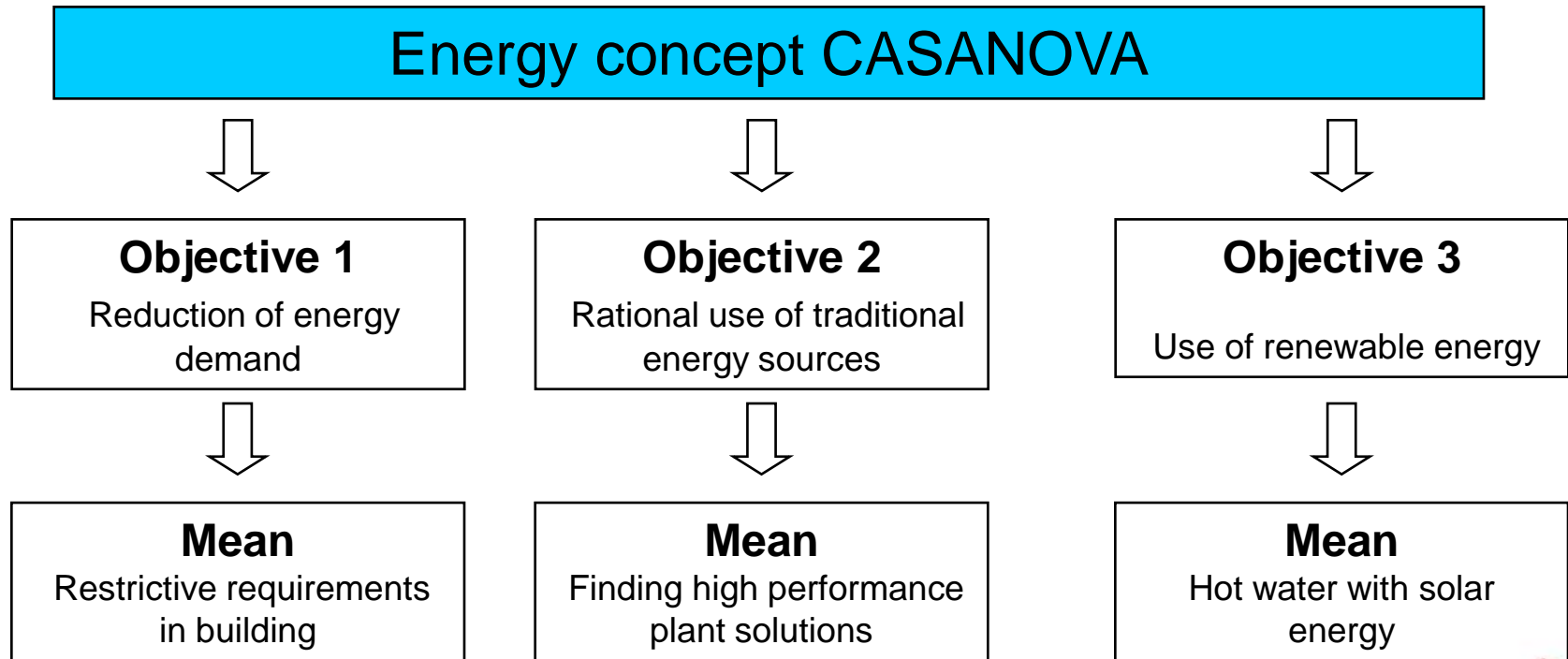
Consumption of energy in buildings in Italy



- A Hot water
- B electric devices
- C Cooking
- D Heating



# Energy - Energy concept

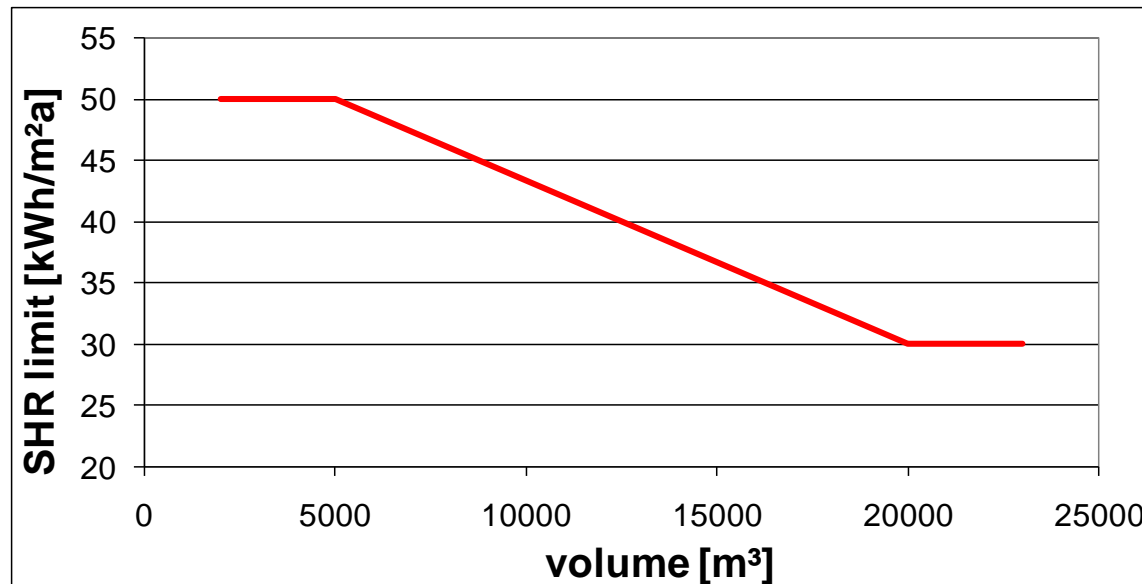


Fonte: Studio Carlini



# Objective 1: reduction of energy demand

The buildings must respect a (parametric) standard KlimaHaus Casaclima A



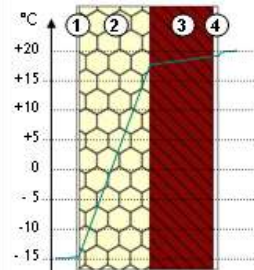
- Reduction of losses
- Optimised use of solar gains



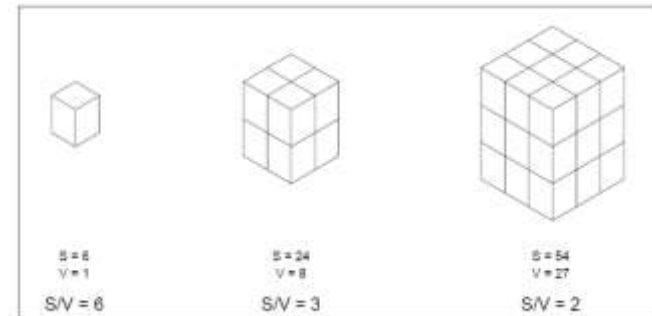
# Objective 1: Reduction of losses

The transmission losses are reduced adopting:

## 1. High insulation

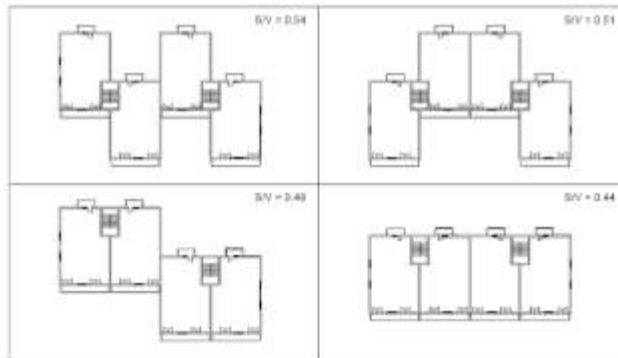


## 2. A low ratio surface / volume

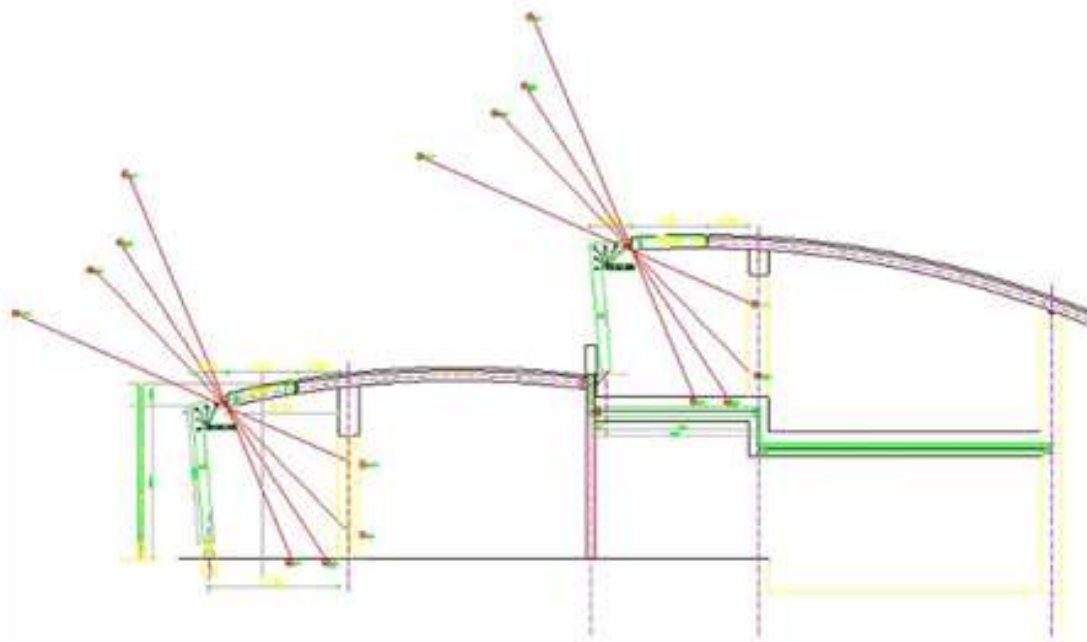


Fonte: Studio Carlini

## 3. A compact form of the building



# Objective 1: Optimization of solar gains

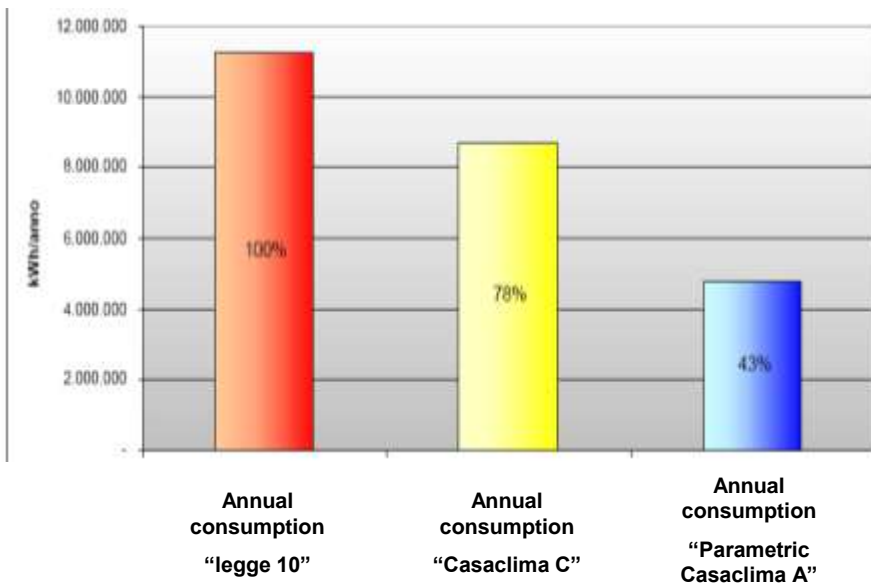


The height of buildings varies depending on the position:  
The buildings to the south have a height lower than the northbuildings;

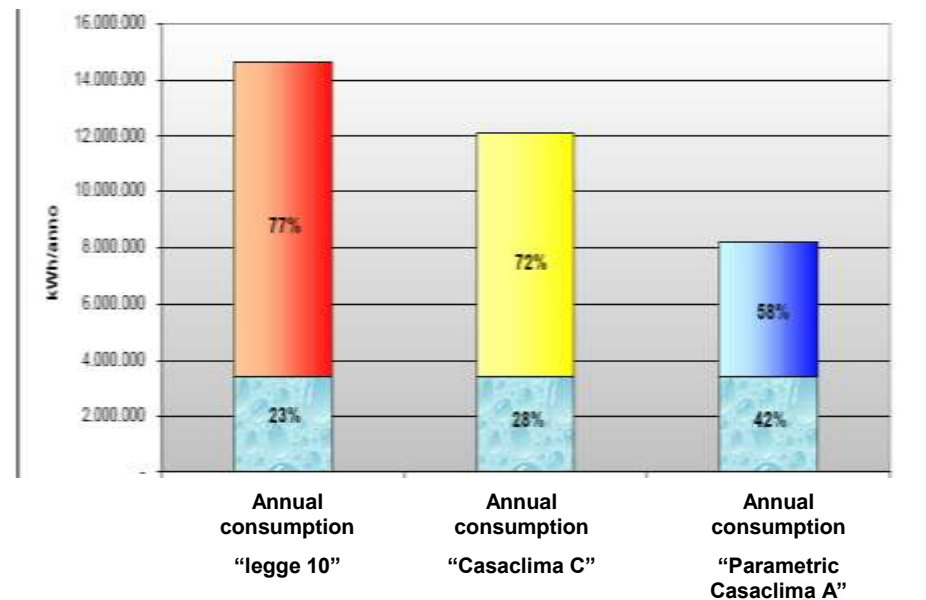


# Benefits of objective 1

Consumption for heating (kWh/y)



Consumption for heating and hot water (kWh/y)



Source: Studio Carlini

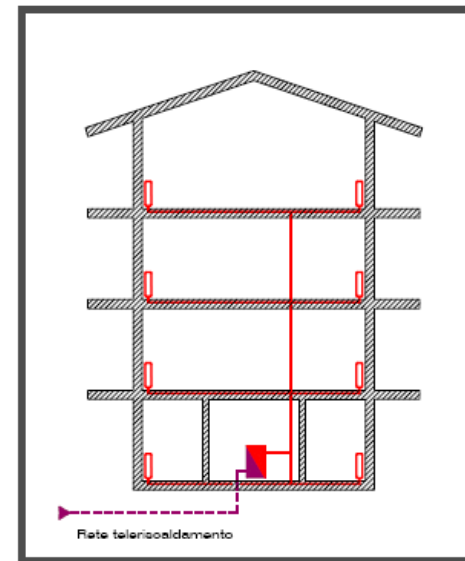
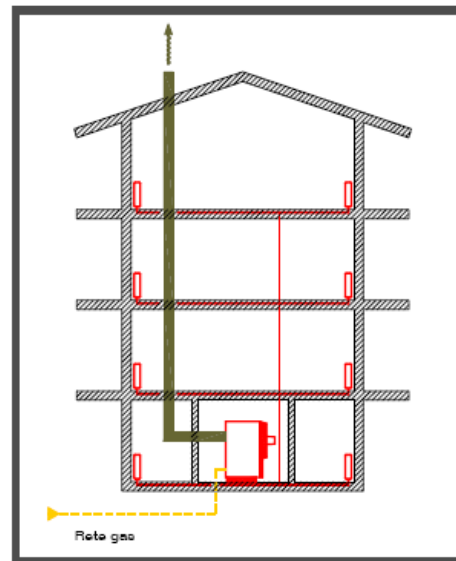
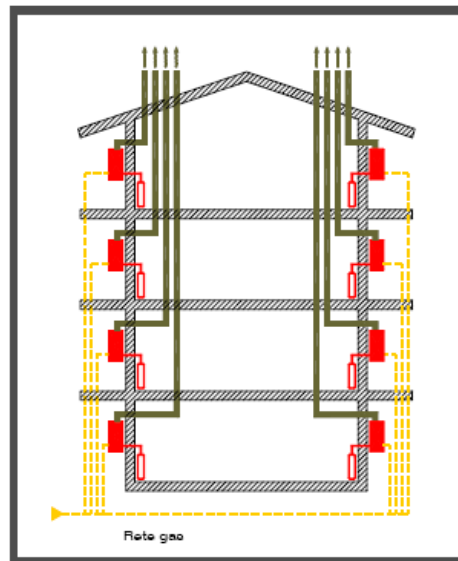




# Objective 2: rational use of energy sources

Comparison between 3 options:

1. Plant with self-boiler for each apartment;
2. Centralized heating plan for every single building;
3. District heating for the entire district.



# Objective 2: rational use of energy sources

Energy yield in winter time (heating and hot water)			
parameter	Self-boiler	Centralized heating plan	District heating
$\eta_k$	87.00%	92.00%	93.00%
$\eta_b$	74.70%	94.20%	99.60%
$\eta_v$	99.00%	97.00%	94.10%
$\eta_{gi}$	<b>64.30%</b>	<b>84.10%</b>	<b>87.20%</b>

$\eta_k$  = yield due to the fireplace's losses

$\eta_b$  = yield due to the shell's losses and to the intermittences

$\eta_v$  = distribution yield

$\eta_G$  = General seasonal average yield

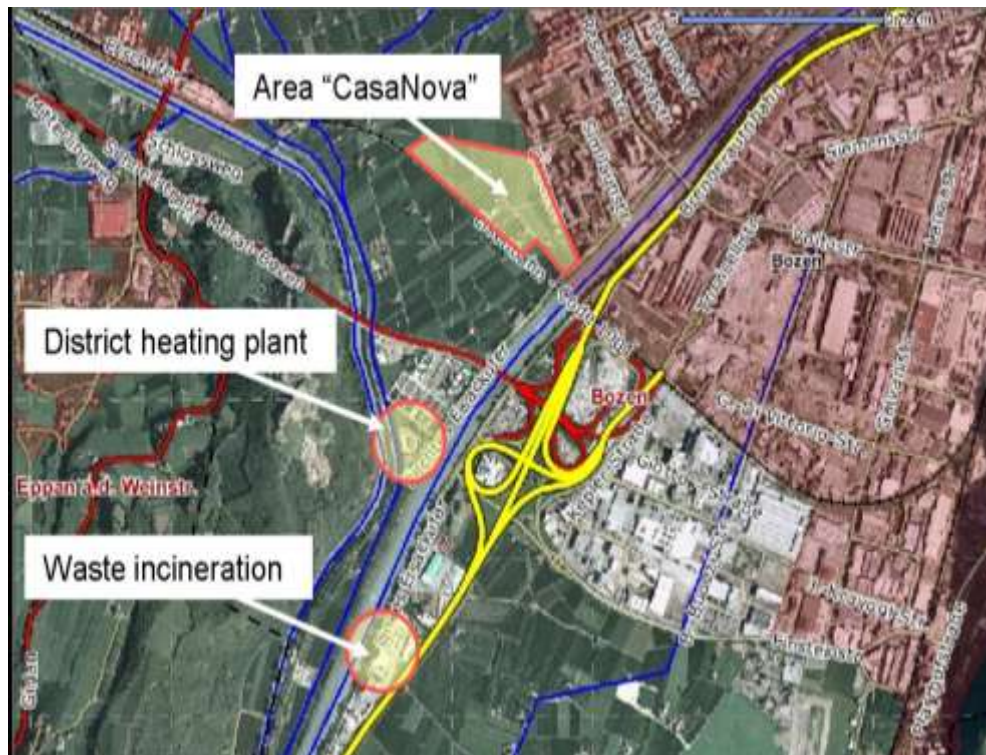
Energy yield in summer time (hot water)			
parameter	Self-boiler	Centralized heating plan	District heating
$\eta_k$	87.00%	92.00%	93.00%
$\eta_b$	53.60%	83.40%	99.30%
$\eta_v$	100.00%	98.00%	87.20%
$\eta_{gi}$	<b>46.60%</b>	<b>75.20%</b>	<b>80.60%</b>

Source: Studio Carlini



# Objective 2: rational use of energy sources

Solution : district heating



Additional benefits of district heating :

- Greater control of pollutant emissions;
- Increased security of the plant;
- Better management and maintenance of the plant;
- Connection to the waste incineration .



# Objective 3: use of renewable energy



- Solar thermal collectors for hot water



- Photovoltaic panels to produce electricity

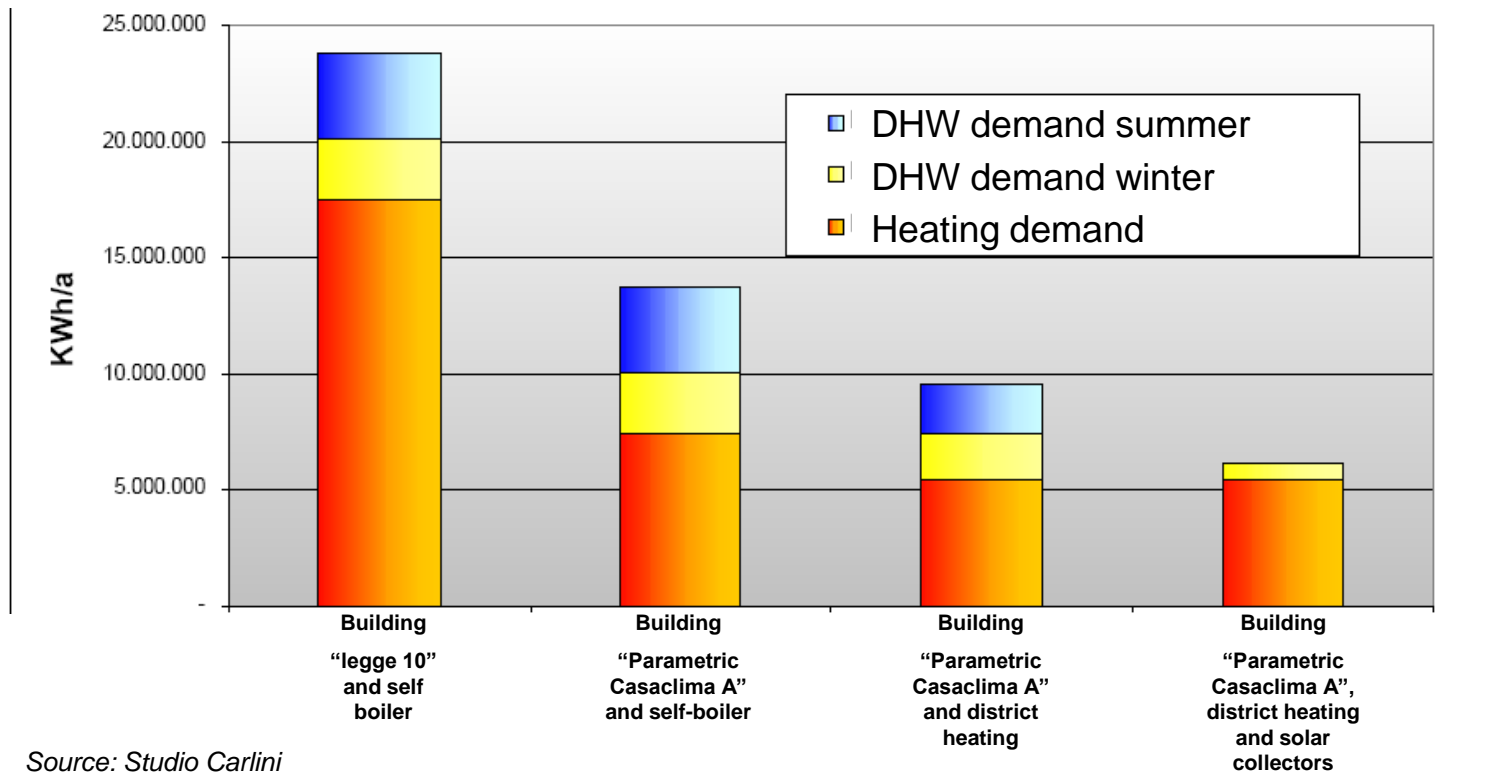


- Geothermally fed heat pumps
- Geothermally preheated ventilation air



# Total energy benefits

Energy demand for heating and hot water (kWh/a)



Source: Studio Carlini

**Total energy savings : > 70 %**



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# Mobility

- There is just one street that crosses the district, which has been made in a tortuous way to make the cars running slowly;
- Regional train station;
- Bus stop terminal at this new railway station;
- Direct connection to the pedestrian ways system and to the cycle paths;



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# Water sustainability

- High permeability of soil;
- Low incidence of underground constructions;
- Rainwater recovery to feed some sanitary devices of the apartments.



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# SEE - CasaNova



*Ministero dell'Ambiente e della Tutela del Territorio e del Mare*



Province of Bolzano



# Activities in the framework of SEE

- Planning and management of a energy monitoring campaign in the district CASANOVA;
- Drafting a technical brochure on the energetic concept at CASANOVA.



# Monitoring - Target

- Access to measured data of energy consumption under every day conditions
- Knowledge of the air quality values and of the comfort indications
- Comparison between the energy consumption and living comfort for the different technical solutions



# Monitoring - Activity program

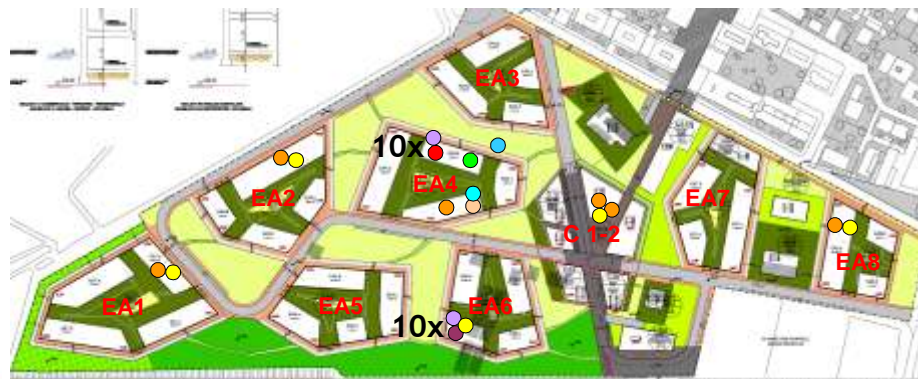
Phase 1: global data of the district;

Phase 2: global data of the buildings ;

Phase 3: data of the single building and apartments;

## Legend:

- |  |   |
|--|---|
| <span style="color: green;">●</span> Weather station               | <span style="color: yellow;">●</span> W-LAN connection          |
| <span style="color: purple;">●</span> Room temperature sensor      | <span style="color: blue;">●</span> Room temperature sensor     |
| <span style="color: lightblue;">●</span> Window open/closed sensor | <span style="color: cyan;">●</span> Air flow sensor             |
| <span style="color: red;">●</span> Combi-Sensor (temp., hum., CO2) | <span style="color: orange;">●</span> Chanel temperature sensor |
| <span style="color: orange;">●</span> Heat flow counter            | <span style="color: lightblue;">●</span> Level sensor cistern   |



# Technical information brochure



Objective : communication and divulgation of the result of the CASANOVA project;

Contents:

Description of the district;

Description of buildings;

Energy concept;

Monitoring plan;



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# Actual status

The construction of the first housing castle was completed in summer 2008. Official inauguration was on 18<sup>th</sup> October 2008.



# Actual status

The construction status of the other housing castles differs. The whole district will be completed in 2012.





Thanks for the attention

Ing. Marco Castagna

