

The slide features a background of a large, stylized fingerprint graphic. At the top left is the 'intense energy efficiency' logo. The title 'Introduction' is centered at the top. The main heading is 'Energy optimized settlement planning and design principles', followed by the sub-heading '- How to overcome fossil town?'. Below the text is a row of six small images: a modern building facade, a city skyline, a street layout plan, a landscape with a winding road, a road with cars, and a traffic jam. At the bottom of the slide, there is a footer with the author 'C. v. Knorre Jan 2011', the word 'Handbook', and the 'INTELLIGENT ENERGY EUROPE' logo with a European Union flag.

How to overcome fossil town?

What can be the part of planning and designing settlements?

How can development be influenced by municipalities and planners?

Of course it is not possible to find one simple ideal answer that fits for all planning tasks. The best solution for energy optimizing would be the one, which leads to a livable place where people like to live for generations. This means to find compromises between manifold aspects: social economic, aesthetic, functional, technical ...

In the frame of this training it is not possible to cover the art of planning and designing. But it is possible to show existing examples of good solutions and to help to analyze the "making of" and to characterize the main aspects leading to energy optimizing.

More about examples for the "making of " municipal steering instruments, see background paper - [http://www.intense-energy.eu/uploads/tx\\_triedownloads/INTENSE\\_HolisticPlanning\\_BG\\_062009.pdf](http://www.intense-energy.eu/uploads/tx_triedownloads/INTENSE_HolisticPlanning_BG_062009.pdf))

This means to simplify the complicated planning and designing process. Such a useful simplification is the identification of 10 main aspects, see slide 2.

### Connection to other themes:

Legislation, energy carriers and renewable energy sources, quality control

### Suggestion:

As next step we suggest a small planning and designing exercise: the task to find a scenario for energy optimized settlement, realization in near future for an exact defined plot. Task is to react to the requirements of this special plot but to integrate as much aspects as possible.

List of possible criteria				
Compactness of settlement/ mixed uses	Short ways to public transport	Social balance	Rainwater and waste management	Reuse of land
Compactness of buildings - relation A/V	Maximizing passive solar gains	Maximizing active solar gains	Soil management	Efficient energy supply - use of renewable

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As useful simplification: the whole list of criteria for energy optimized settlement planning:

- The compactness of the settlement, short ways to places of interest or working places;
- Short ways to public transport;
- Social balance to get a sustainable living quality for generations;
- plots to realize low energy or passive houses;
- minimizing heat losses: presetting compact building types with good relation A/V (outer surface to inner volume);
- maximizing passive solar gains: good grouping of houses to avoid shadow at the facades;
- maximizing active solar gains: good orientation of roofs or providing areas for direct use of sun energy;
- providing use of district heating: use of renewable as much as possible;
- Minimizing harm to the environment: reuse of land if possible;
- If new settlement: soil management - good use of soil, avoiding big transfers of materials;
- Rainwater management;
- Waste management.

Some more figures as background information:


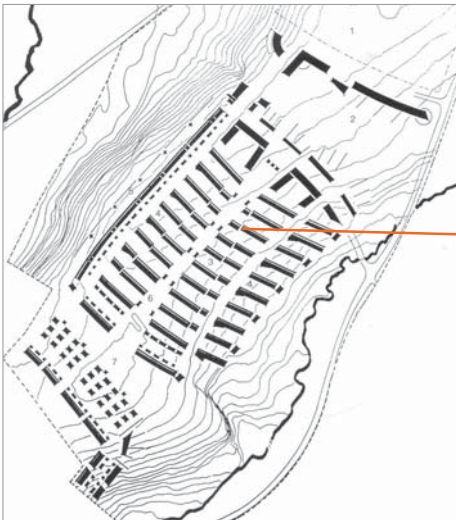
Some aspects of energy saving urban planning should be proved during the planning process for generating energy savings with low efforts, only by optimizing the form and orientation of buildings. The potentials of measures can be estimated as follows:

1. compactness: difference of energy consumption between multi storey house and 5 row houses, both with similar energy standard: 20%
2. orientation: difference of energy gains between 5 houses with a bad orientation compared with a optimized orientation: 15%
3. passive solar gains, no shadows: difference between solar gains of a row of 5 houses without any shadow at the facade and the same row with shadow at the facade: 10 %
4. optimised roofs for active solar use: difference between solar gains of a optimized orientation of a roof and a bad orientated roof for the use of solar panels for hot water supply: 10 – 15%

See: UVP Handbuch der Stadt Köln Amt für Umweltschutz und Lebensmittelüberwachung/  
Dr Goretzki/eboek Köln 1998

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Energy optimized settlement planning: 2 cases



Maximizing passive solar gains

Maximizing active solar gains

Efficient energy supply - use of renewable

Compactness of buildings - relation A/V

Rainwater and waste management

Coburg,  
Solar optimized settlement  
all buildings are orientated in optimised way  
without shadows on facades  
1999

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Two different cases may help to distinguish manifold ways to come to solutions for energy optimized settlement planning and designing.

Coburg solar optimized settlement is the one where it is easy to identify the main aspect at one glance: energy saving by maximizing active and passive solar gains.

Long rows of multi storey residential houses where orientated strictly to the south west. This focus on orientation can be followed also in the zoning of rooms in the floor plans.

The energy support is partly covered by solar power: solar thermal panels for warm water and heating and photovoltaic panels for electricity.

One further aspect is the compactness of buildings. Heat losses via building envelope where minimized by simple compact forms of buildings and by grouping stair cases outside the heated volume, see picture.

What cannot be recognized at first glance are special efforts for rain water management - rain water is collected on surface and not swallowed in by any drainage.

For more information about the project see:

[http://www4.architektur.tu-darmstadt.de/powerhouse/db/248,id\\_93,s\\_Projects.en.fb15](http://www4.architektur.tu-darmstadt.de/powerhouse/db/248,id_93,s_Projects.en.fb15)

key word solar house Coburg

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Energy optimized settlement planning: 2 cases

Hannover Kronsberg

Compactness of buildings - relation A/V

Efficient energy supply - partly use of renewables

Maximizing active solar gains

Short ways to public transport

Social balance

Soil management

Mixture of uses

Rainwater and waste management

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In opposite to the first example, for Hannover Kronsberg it is not so easy to find the main aspects at the first glance. The plan looks not very special, the whole efforts to create an energy optimized sustainable settlement can only be found by taking a closer look.

No aspect is much stronger than the others.

Flats are grouped in residential or row houses to minimize losses via building envelope. They are mainly orientated in east west direction. Partly there are special efforts to prepare roofs for solar applications, for warm water and heating, see second photo.

Via land sale contracts energy standard for low energy houses and passive houses was fixed, see picture 1.

Energy supply is covered with cogeneration plants and supported by renewable, wind and solar power.

In order to come to the holistic approach of the whole settlement:

A new tramline was constructed, the blue line, so that all parts of the Kronsberg got short ways to public transport. Some efforts were done to mix functions: along the main street with the tram line are located shops and offices. In the near surroundings big companies offer working places.

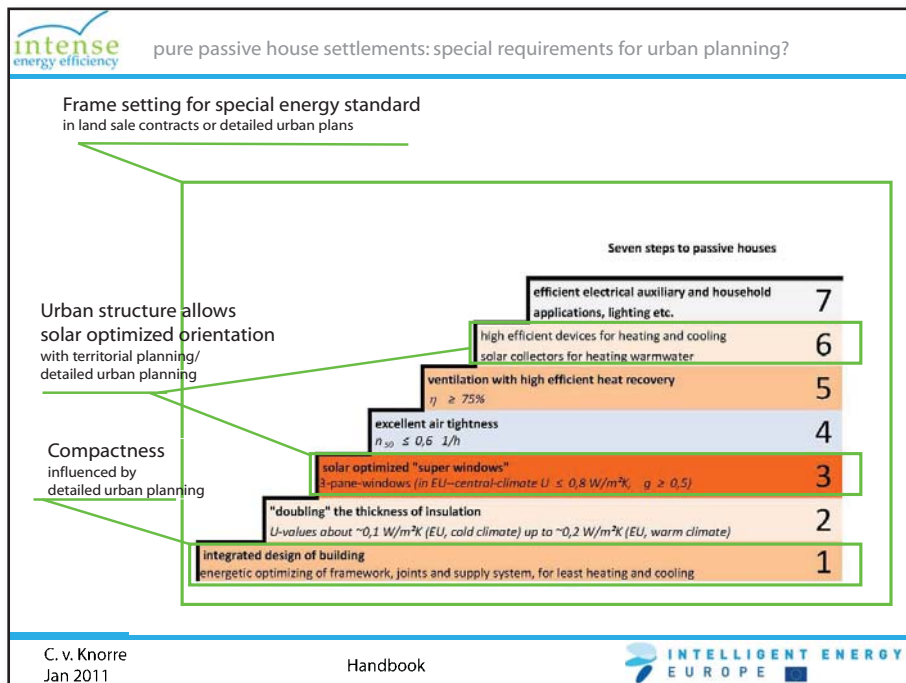
The settlement is equipped with all kinds of infrastructure, shops for daily use, schools, kindergarten and meeting rooms for different activities.

A mixture of sizes and types of flats should guarantee a good social balance.

Efforts for soil, rainwater and waste management are done,

For more information see:

<http://www.oekosiedlungen.de/kronsberg/steckbrief.htm>, in German  
short description in backgroundpaper page 22 ff



Which one of the typical „seven steps to passive house“ has a linkage to urban planning/settlement planning?

Most of the typical measures to fulfil passive house requirements had to be undertaken on site and did not attract the neighborhood, like the doubling of insulation or the ventilation system. But the orientation to optimize active and passive solar gains are very important and in phase of design, the compactness had to be optimized, see the three small green boxes.

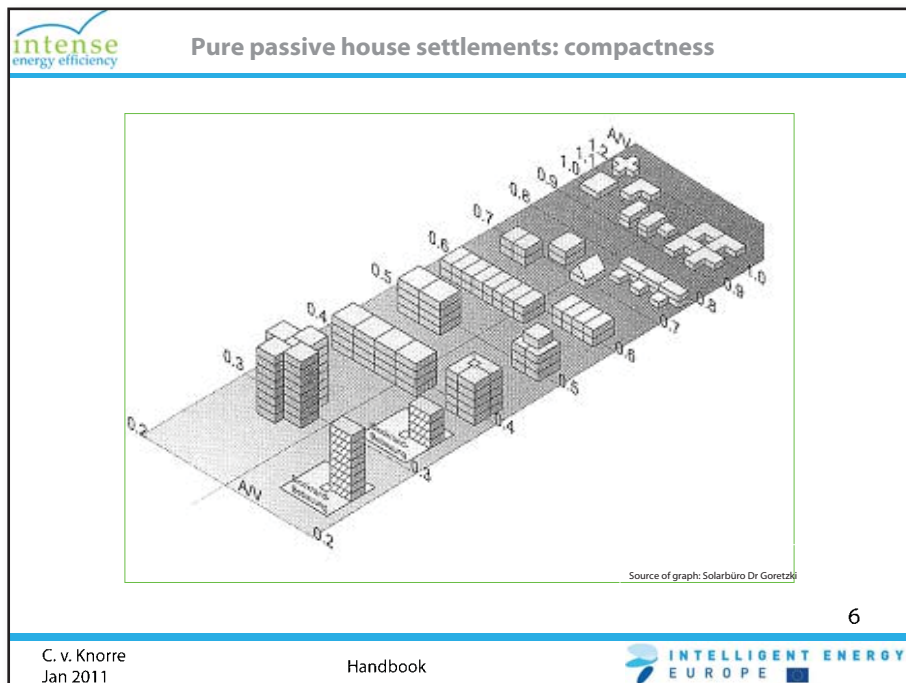
(about compactness see next slide)

If one house should fulfil passive house standard, the site had to be checked, if the orientation can be optimized. If a whole passive house settlement had to be planned, it had to be checked in frame of territorial planning, if the sites allows goop orientation for the settlement. With detailed plans, the best orientation can be fixed.

(About solar orientation, see over next slide)

The big green box indicates the possibility of urban steering instruments to set an energy standard for a new settlement (national standard -30% or passive house standard, plus certification) The best possibility can be to use land sale contracts to fix these special standards.

More about examples for the "making of" municipal steering instruments, see background paper (link: [http://www.intense-energy.eu/uploads/tx\\_triedownloads/INTENSE\\_HolisticPlanning\\_BG\\_062009.pdf](http://www.intense-energy.eu/uploads/tx_triedownloads/INTENSE_HolisticPlanning_BG_062009.pdf))



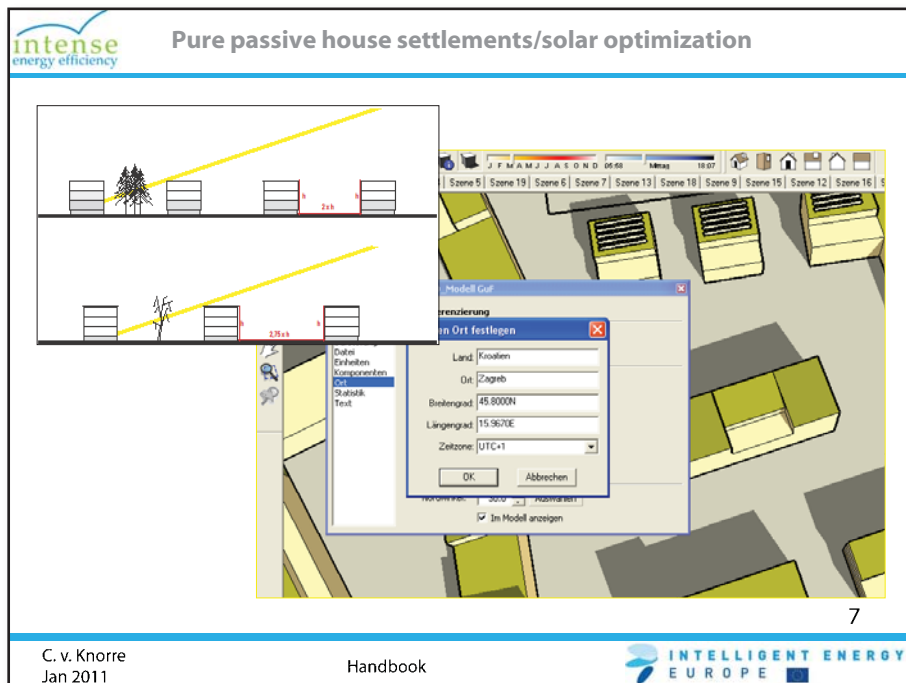
This graph shows typical A/V relations (relation of outer surface to heated volume) of buildings.

The smaller the figure, the better the ratio, the more easy to optimize the building envelope.

It is easy to see, how these figures changes from detached houses, from houses with complicated forms to very simple formed multi storey houses.

The best ratio is easy to find at the biggest, simplest building.

All that means, the art of urban planning is to find a good compromise between energy efficient A/V ratio and living quality.



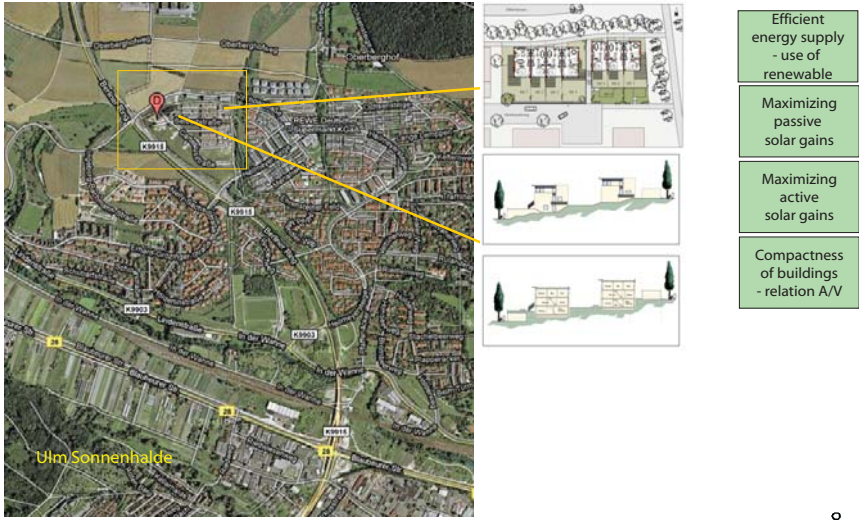
The picture left shows:

These very big distances between the buildings can lead to a conflict with the compactness of a settlement. You can see, that on the same ground three rows of houses find place instead of four.

Special software can help to find compromises. The simplest method is to use free ware „sketch up“, as shown on the right. (possibilities to insert location/ month/hour and to play through shading situation)

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### Pure passive house settlements: 2 cases



- Efficient energy supply - use of renewable
- Maximizing passive solar gains
- Maximizing active solar gains
- Compactness of buildings - relation A/V

Ulm Sonnenhalde

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One example for optimized orientation:

The first example of a „pure passive house settlement“ is Ulm Sonnenhalde, realization 1998-2000, 108 flats in row- and double houses.

The settlement is located on the south slope of a valley, so it is predestinated for solar settlement. Even in wintertime, solar gains are “guaranteed”.

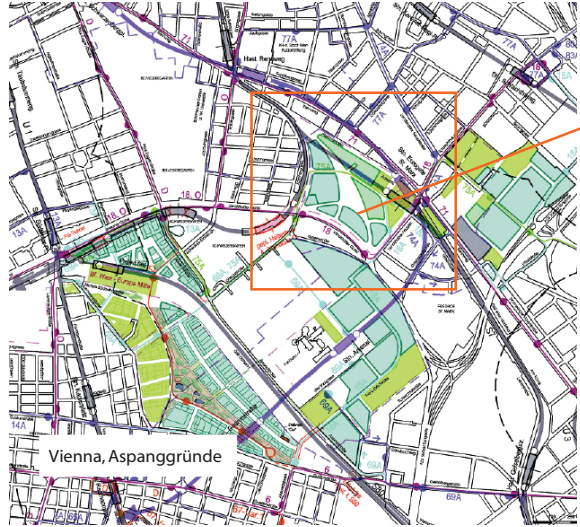
As shown in the section picture two and three, the distance between the volumes is well balanced, using the slope situation.

The municipality owned the land and fixed via land sale contract, that the 8 involved investors had to prove their buildings as passive houses. They all passed the certification.

The situation on the slope leads is perfect for solar optimization, the types of houses (row houses) shows a good compromise between compactness and living comfort.

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Pure passive house settlements: 2 cases



Vienna, Aspanggründe

Compactness of buildings - relation A/V

Social balance

Short ways to public transport

Maximizing passive solar gains

Reuse of land

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On example for optimized density:

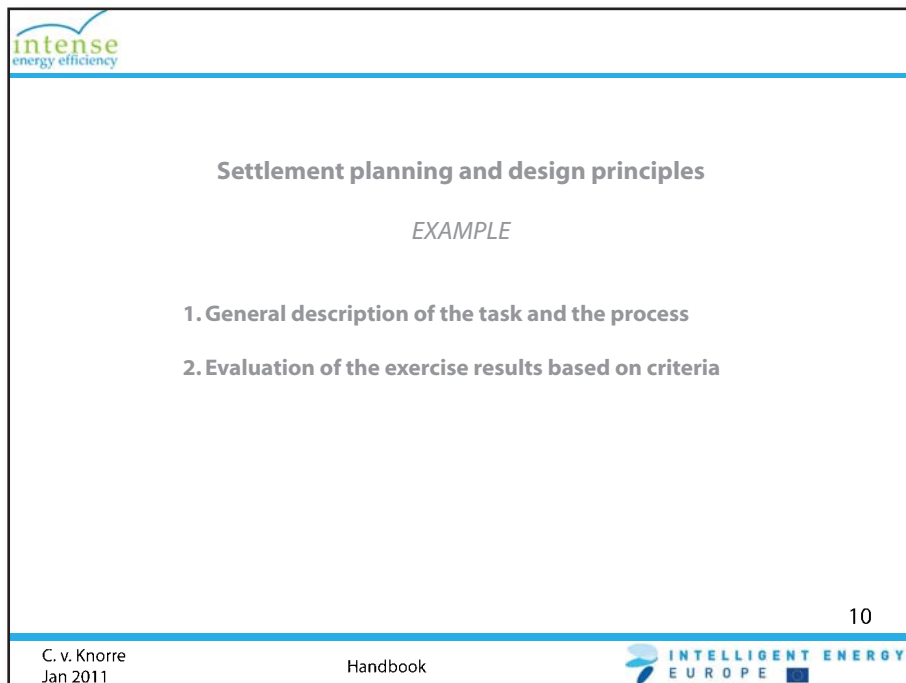
The second example shows one of the biggest planned passive house settlements in Austria:

Vienna Aspanggründe. It is a typical brownfield development. Changes in railway transport systems opens the possibility to reuse this area in the densely build up city.

The area will offer 400 new flats and working places in passive house standard.

In opposite to the first pure passive house example, here is strictly compactness/density the issue. The more compact a building, the less the efforts to reach the passive house standard. In this case, most of the buildings will be built as social residential homes.

But the orientation of the big buildings had been checked and optimized as good as possible, see picture 1.



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**Settlement planning and design principles**


*EXAMPLE*

- 1. General description of the task and the process**
- 2. Evaluation of the exercise results based on criteria**

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1. General remark:

The INTENSE partner municipality of Cesis offered the plot and plans. Cesis is elaborating a **NEW TERRITORIAL PLAN FOR CĒSIS MUNICIPALITY INCORPORATING ZONES FOR ENERGY EFFICIENT BUILDINGS** as one INTENSE mini project.

The plot is one of the possible areas for energy efficient buildings owned by municipality.

In this case some decisions are fixed by municipality and could **not** be influenced by “planners of the exercise”: the location of the plot in the town, distance to town center, the land use of plot and surroundings, distance to important infrastructure and distance to main axes of public transport.

This situation can be seen as typical task for a competition for urban planners or architects.

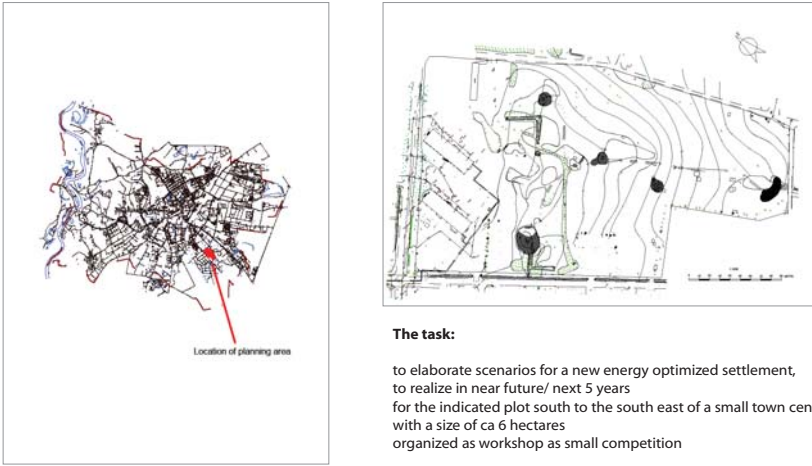
To organize the exercise as competition with working groups of competing teams brings in a fruitful “fever”.

In the first part of this presentation the task and the plot will be described in detail by adding some technical hints.

In the second part, the results of example group work from INTENSE 2<sup>nd</sup> Train the Trainers event will be shown and it will be brought out which of the ten criteria can be found in these scenarios.

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### 1. General description of the task and the process



**The task:**  
to elaborate scenarios for a new energy optimized settlement,  
to realize in near future/ next 5 years  
for the indicated plot south to the south east of a small town center  
with a size of ca 6 hectares  
organized as workshop as small competition

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The left plan shows the whole territory of Cesis without fixed scale. The location of the plot is marked to get an impression about distance to town center, main routes, station and the open field.

The right plan shows the plot. In a scale of 1:1000 it covers a A3 format. The scale is not very detailed but allows to show type, grouping and orientation of houses, parking places, public and private space. Numbers of storeys can be indicated.

The lines indicating the altitude: all 0,50 m

In the northern corner of the plot are located two old multi storey buildings. It is up to the competitors to renovate or demolish the buildings.

#### Material to prepare:

All competitors should get copies of both plans, transparent paper, different markers, copies of background material, see next slide.

All equipment should be easily available and usable in the usual conference rooms.

If this exercise takes place in the university, there are of course more possibilities: to use styro cutter and styro foam or other material to create also a model in three dimensions or to use CAD or sketchup for simple 3D sketches.

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### 1. General description of the task and the process

**Territorial division - 19,200 ha!**

20% Green spaces  
20% Residential  
20% Commercial  
20% Industrial  
20% Public services  
20% Other uses

**Energy optimising:**

The scenario for new settlement had to be elaborated by taking into account as much of the following aspects as possible and finding compromises between different approaches:

- The compactness of the settlement, short ways to places of interest or working places;
- Short ways to public transport;
- Social balance to get a sustainable living quality for generations;
- plots for a low-energy or passive house;
- minimizing heat losses: getting compact building types with good relation A/V (outer surface to inner volume);
- maximizing active solar gains: good grouping of houses, to avoid shadow of the facades;
- maximizing active solar gains: good orientation of roofs, or providing areas for direct using of sun energy;
- providing use of district heating: use of renewable as much as possible;
- Minimizing harm to the environment: reuse of land if possible;
- For new settlement: soil management: good use of soil, avoid big transfers of materials;
- Rainwater management;
- Waste management;

Maximizing active solar gains	Compactness of settlement/ mixed uses	Soil management	Efficient energy supply - use RES	Compactness of buildings - relation A/V
Rainwater management	Short ways to public transport	Social balance	Reuse of land	Maximizing passive solar gains

**The material for each working group:**

- Plan of the plot in scale 1:1000,
- Plan of surroundings no scale
- List of the task, timetable
- Background information about the town,
- list of criteria as relevant for the "competition"

**Working time:**  
 First block → 11.00—12.00  
 Second block → 13.30—14.00  
 and for more ambitions the evening... close of working rooms at...  
**Final presentation: 25.08.2010 at 9.00!**

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All competitors got a task list with some background material about the town and the list of the 10 criteris.

Experience shows that all background materials were read carefully by competitors and questions where asked for better understanding during the first hour. It was useful for organisers to go from table to table to ask for misunderstandings.

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### 1. General description of the task and the process



**Working time for the groups:**  
in average four hours,  
including individual coffee breaks  
no limitation

**Size of groups:**  
3 - 5 persons

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In this case the groups worked in two rooms – twogroups in one room and three groups in other room. No problem!

The sizes of groups were different: three to five persons.

In this case this was obviously no problem to get all participants involved in the process but better are groups of three to four.

The groups got two working table plans, background material, transparent paper and flip chart paper to prepare the final presentation.


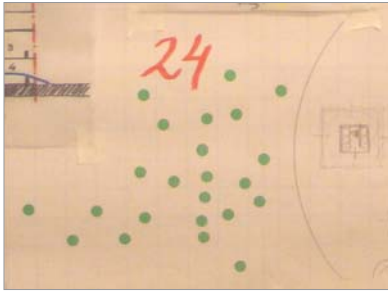
Two groups asked for using CAD. This causes no problems!

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### 1. General description of the task and the process

**Evaluation of competition:**

- presentation of working group results
- exchange about criteria or extra aspects
- All competitors change into jury after presentation,
- they got two dots per person and were asked to glue the dots to the result, they judge as best solution for the task
- the dots were counted, to find out the winner



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### Material to prepare:

Looking for a place, where plans can be presented and all participants can have access to place the dots later on.

Preparation of small dots to glue for all participants.

Do not forget a small gift for the winning crew!

Do not forget to take photos of results and winning team!

2. Evaluation of the exercise results based on criteria

**Group 1 criteria**

- Maximizing active solar gains
- Maximizing passive solar gains
- Compactness of settlement / mixed uses
- Soil management
- Rainwater management
- Efficient energy supply - use RES
- Reuse of land so far as possible

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Main idea of the scenario:

optimizing of orientation of row- and blockhouses for active an passive solar use. Economically reasonable building types.

Houses and private gardens of row houses are embedded in green public space with lakes and rivers.

Density decreases from north to south.


The north east edge is formed as entrance of settlement with public uses, shopping

The old buildings would be renovated.

Parking places are grouped and concentratede so that the inner part stays car free.

Energy supply with district heating, using RES.

### 2. Evaluation of the exercise results based on criteria



Group 3 criteria

- Compactness of buildings - relation A/V
- Maximizing active solar gains
- Soil management
- Rainwater management
- Efficient energy supply - use RES
- Reuse of land so far as possible

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Main idea of the scenario:

Open public space, park, green with few solitaire houses of up to 10 storeys, see picture below.

Some infrastructure is integrated into the houses, except the sport yard, which is separated in the north east part of plot.

Public/social space is integrated into the solitaires Atrium as middle axe.

The old buildings would be renovated.

Parking places are grouped and concentrated so that the inner part stays car free.

Energy supply with district heating, using RES.