

**sufficiency** strategies  
urban **architecture**  
summer school 2015



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## introduction



„Frankfurt Kitchen“ from Ernst May (1926) as first example of space efficient design  
source: Förster, Wolfgang: Housing in the 20th and 21st Centuries; München / Berlin / London / New York 2006, S.39



Architecture and urban design portrays its society and reflects their cultural, social, and technological achievements. With this in mind, the façade of an individual building and urban space represents and describes the residents of a given area. Although the content and form of architectural expression has changed from one era to the next, the role as the representative “face” of a society, even during the radical façade reduction in classic modern times, has not changed. In accordance with energy transition and the increased change from using fossil fuel to renewable energy sources, building surfaces and urban spaces need to fulfill new demands. Since the middle of 1977 architectural and urban surfaces meet increasing energy requisites in addition to their representative and constructive tasks. This is due to the enormous energy demands of buildings and cities worldwide. Globally cities are responsible for 80% of our energy needs. Therefore a supply of renewable energy needs to be decentrally organised and locally produced.

In the temperate climate of Germany, ever since the first German thermal Insulation Ordinance in 1977, these energy requisites are dealt with particularly in terms of heating. Aside from minimizing heat loss through the building envelope, passive strategies that use solar power and sufficient openings make the interior rooms livable. Residential buildings have developed, through the progressive reinforcement of energy requirements, from a purely structural-physical principle to a passive house standard. This sets particularly high demands on the quality of the building envelope by strict limits on the transmission heat loss and high passive gains, regulated through building openings. Further demands for passive gains require a certain amount of window surface area depending on the buildings compass direction and a minimum distance between buildings. An energetic optimum in Germany is achieved through maximizing building openings to the south and, at the same time, minimizing openings on the other sides of the building.

In recent times active strategies for buildings and urban spaces have been in the focus of research and planning. With the progressive development of technical systems such as solar panels or photovoltaic systems, more and more building surfaces are producing the buildings own required energy. In the past years, a growing num-

## introduction

ber of buildings with “zero-energy” or “plus-energy house” standard have been constructed. The buildings remaining energy demand is reduced through passive measures and profits from its own production of energy; electricity from Photovoltaic for example. In many cases, a building can produce more energy than needed and thus has a surplus of energy. In order to maximize energy production, specific buildings shapes and surface designs have been developed. Plus-energy houses require, just like passive houses, a minimum distance to surrounding buildings to avoid shade. In addition, an energetic optimum is achieved by making use of south oriented roofs and façades. Passive and active strategies require both south façades which can lead to conflicts (passive-house: window positioning / plus-energy house: photovoltaic surface). In addition, more conflicts arise in terms of the supply of daylight in interior rooms, ventilation, and design.

This shows that the requisites on the surface of buildings and urban spaces have become very complex. It is the planners and architects job to balance out and fulfill these complex requirements in order to have a holistic overall design. Adaptive can mean a changing system that automatically reacts to the surrounding circumstances; passive or active matters through solar yield or sun and heat protection for example. Another form of adaptation however can also be seen in terms of flexibility or multifunctional building structures that adapt to the ever changing building requirements; a structure with a curtain wall that can easily be dismantled and replaced to comply with changing building envelope demands.

**active** buildings-  
active **cities,**  
summer school 2013

**adaptive** skins  
urban **structures**  
summer school 2014

**sufficiency** strategies  
urban **architecture**  
summer school 2015

## introduction

### summer school 2013, active buildings – active cities

In the beginning, the many facets of sustainable architecture and urban planning are discussed. The previously described limits of coverage and balance all the way to establishing its potential on the scale level of the district. The expertise gained by the field of Design and Energy Efficient Building through the “SolarDecathlon” 2007/2009 (zero plus houses – new buildings) and “Efficiency Plus in Old Buildings, Neu-Ulm” (zero plus energy houses in old buildings) as well as the work in urban projects “UrbanReNet”, “Plus-energy-district Oberursel” and “Energy strategy Heilbronn” are integrated into the teaching program.

### summer school 2014, adaptive skins in urban structures

The second summer school in 2014 will engage into a deeper view into the necessary synergy for training and networking opportunities and the needs of active energy systems. The lectures will focus on the integration of the surfaces of physical structures and urban spaces. The transformation of existing energy systems requires the systematic use of local energy sources – it will become necessary to energetically use the surfaces of buildings and spaces. A particular challenge here is the integration of said systems without influencing the previous functions of the façade (for example: so far; representation, weather protection; in the future; production of biomass, energy storage; in the future; climate regulation).

### summer school 2015, sufficiency strategies in urban architecture

Sufficiency is one of the three columns of sustainability. Nevertheless, until now little attention has been paid to it in the architecture and urban planning. Research topics about sustainable architecture currently focus on improvements in energy efficiency, the integration of active systems into buildings or creating synergies by interconnecting urban spaces. Increasing demands of the society have currently halted all efforts. Energy demands have been lowered in Germany from approx. 210 kWh/sq. m a (1949) to 150 kWh/sq. m a (2012). But all these savings have been “equalized” by the increasing surface demand per person from 19 sq. m (1949) to 43 sq. m (2012). Therefore all measures remain ineffective until sufficiency strategies are developed and practiced.

## international exchange and networking

The summer schools 2013-2015 at the Faculty of Architecture, TU Darmstadt pursue the goal of an international networking and cooperation between universities and the participating students in the subject area of sustainable and energy efficient construction. The complex global issues of climate change and scarcity of resources is addressed to transnational cooperation of students on the key topics of urban planning and construction. The environmental relevance of this issue is illustrated by the urban and building-related consumptions. Cities use up to 80% of the global energy consumption, while the existing buildings alone causes about 40% of all carbon dioxide emissions.

The summer school deals with this problem in a particular way. High level of knowledge and creative work in intercultural teams composed encourage you to find innovative solutions to the urgent social tasks, this is cross-linked to both the urban as seen on architectural design processing levels. Through intercultural exchange between students and universities, an intensive knowledge and experience transfer is stimulated. Expected are novel design, constructive and technical concepts for environmental friendly constructions and sustainable urban developments, across all countries and climatic zones. The participating universities are selected according to global and large cultural differences, thereby providing a high degree of innovation and knowledge gained in the work of the students, teachers and researchers is expected.

The results of each summer school are summarized by the organizer in bilingual documentations and made available to all participants. They shall also be made available to the public via technical papers.



**participants 2015**

## **participants 2015**

The summer school is organized and represented  
by the Department of Architecture at the Technical  
University of Darmstadt

Design and Sustainable Building Unit  
Prof. Christoph Kuhn

Design and Technology Unit  
Prof. Anett-Maud Joppien

Energy Efficient Building Design Unit  
Prof. Manfred Hegger



Professors and students from the following international universities are taking part in the summer school 2015 „sufficiency strategies in urban architecture“:

Univeritas Trisakti, Jakarta, Indonesia  
Faculty of Civil Engineering and Planning  
Dr.Ir. Martinus Bambang Susetyarto, MT



ISCTE – Instituto Universitário de Lisboa, Portugal  
Faculty of Architecture and Regional Planning  
Mrs. Teresa Madeira da Silva



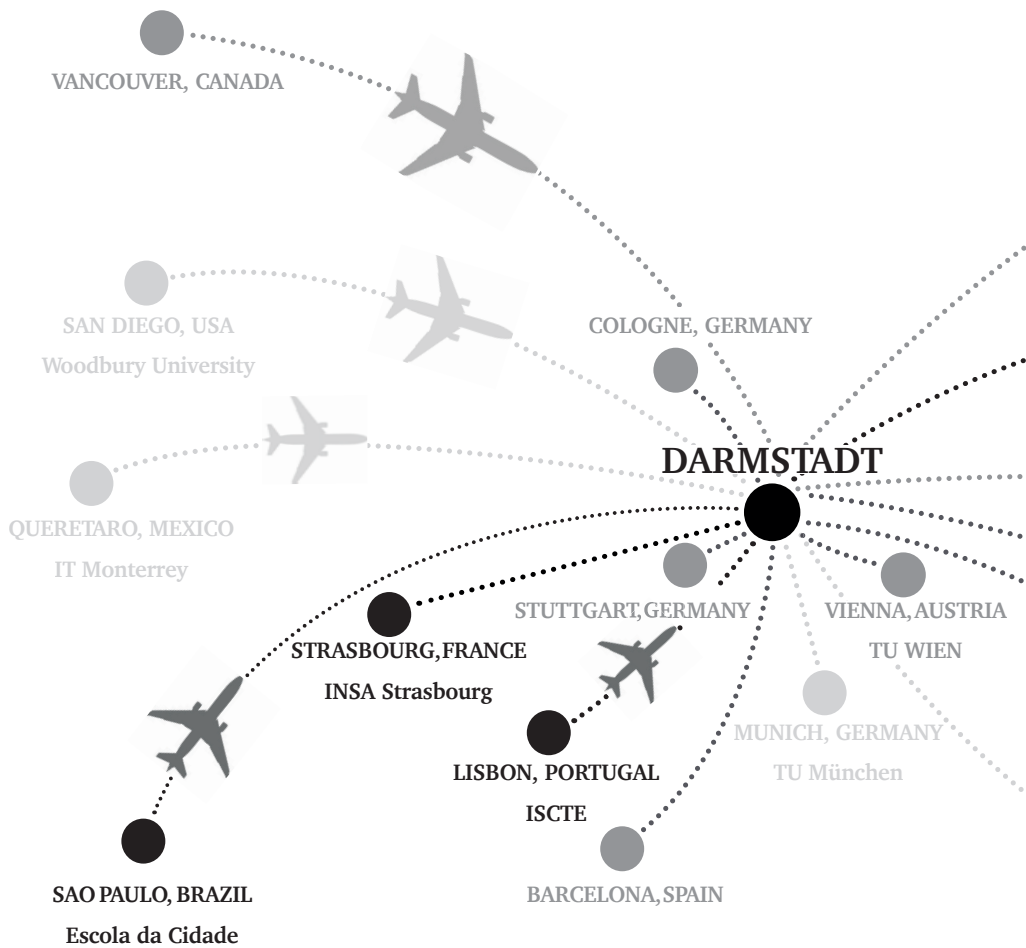
Institut National des Sciences Appliquées de  
Strasbourg, France  
School of Architecture and Planning  
Mr. Guillaume Delemazure

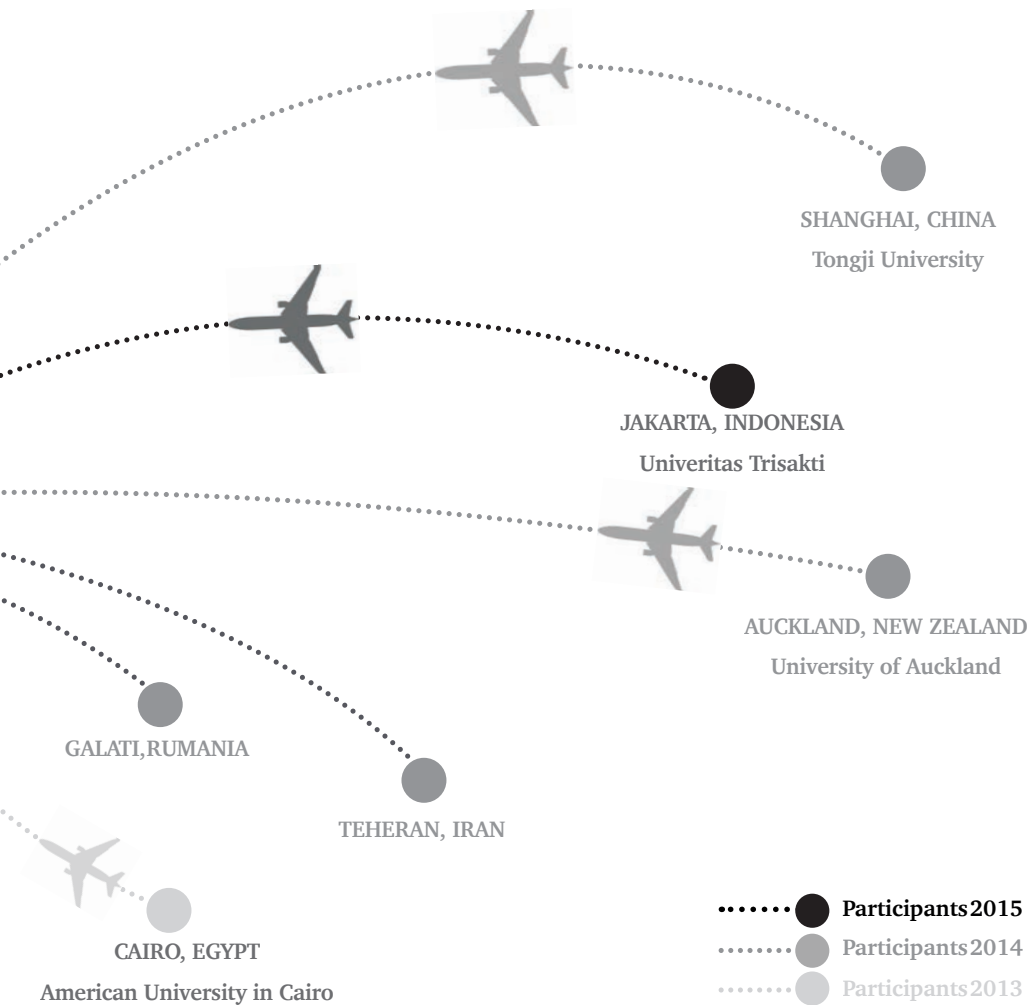


Escola da Cidade, Sao Paulo, Brazil  
Faculty of Architecture and Urbanism  
Mr. Sebastian Beck



Along with students from the listed universities, we are pleased to welcome other participants from Italy, China, Pakistan and Germany.





## participants & team 2015

Yasmin Amalina (id), Zahra Rizkia Andini (id), Susana André (pr),  
Gabriela Atanasova (de), Sara Baião (pr), Laura Bellotti (br), Pierre Caraud (fr),  
Gabriel Cesar da Costa e Silva (br), Laura Levi Costa Sousa (br),  
Reza Mahdi Daniswara (id), Stefano Dastoli (de), Frederico Duff de Azevedo (br),  
Elvia Erosa (mx), Nur Evitasari (id), Joao Pedro Francisco (pr), Giovanni Frazzatto  
(br), Pedro Gaspar (pr), Julia Godinho Vaz (br), Amalda Alisia Hutasuhut (id),  
Bo Jin (de), Juliana Katayama (br), Camille Madinier (fr), Camila Moraes (br), Har-  
ly Valiant Noviano (id), Veronika Pöschel (de), Nabila Antari Prasanti (id),  
Finsa Hutama Putra (id), Joana Rodrigues (pr), Leticia Sampaio Encinas (br),  
Carolina Simao (br), Sabrina Sinelli Sobreiro (br), Alifa Imama Syahnovy (id),  
Chen Tao (pr), Anak Agung Sagung Ayu Tirta (id), Gladys Vasquez (gu),  
Adha Montpellierina Viala (id), Mutiara Pudya Wihertinindia (id), Mindy Zhang (ch)  
Manfred Hegger (de, prof.), Anett-Maud Joppien (de, prof.), Christoph Kuhn (de,  
prof.), Christoph Drebes (de, aca. + org.), Mieke Pfarr-Harfst (de, aca. + org.),  
Steffen Wurzbacher (de, aca. + org.), Christian Herbrich (de, org.), Verena Kreß (de,  
org.), Lazar Tsankov (de, org.), Sebastian Beck (br, aca.), Guillaume Delemazure (fr,  
aca.), Pedro Mendes (pr, aca.), Martinus Bambang Susetyarto (id, aca.),  
Teresa Silva (pr, prof.)





## **program**

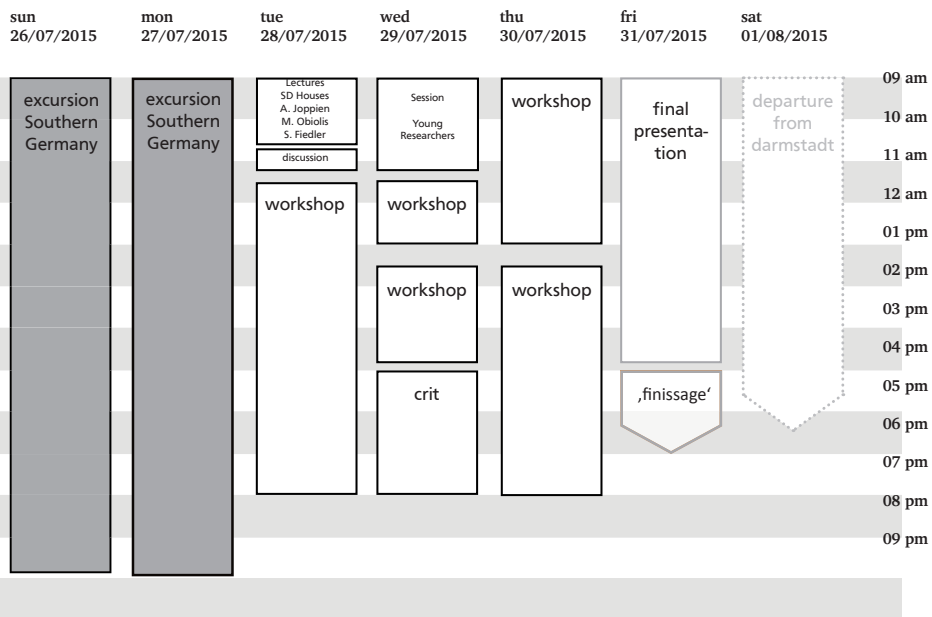
**sufficiency strategies urban architecture, summer school 2015**

**20th July - 31th July 2015**

overview program

	<div>sun</div> <div>19/07/2015</div>	<div>mon</div> <div>20/07/2015</div>	<div>tue</div> <div>21/07/2015</div>	<div>wed</div> <div>22/07/2015</div>	<div>thu</div> <div>23/07/2015</div>	<div>fri</div> <div>24/07/2015</div>	<div>sat</div> <div>25/07/2015</div>
09 am		<div>get together</div>	<div>Lecture</div> <div>M. Hegger</div>	<div>Lecture</div> <div>A. Steffen</div>	<div>Lecture</div> <div>P. Gotsch</div>	<div>Lecture</div> <div>K. Daniels</div>	<div>excursion</div> <div>Southern</div> <div>Germany</div>
10 am		<div>welcome</div>	<div>Lecture</div> <div>Chr. Kuhn</div>	<div>Lecture</div> <div>M. Knöll</div>	<div>Lecture</div> <div>L. Piccon</div>	<div>Lecture</div> <div>S. Thoma</div>	
11 am							
12 am		<div>international</div> <div>input</div>	<div>release of</div> <div>exercise</div>	<div>workshop</div>	<div>workshop</div>	<div>workshop</div>	
01 pm							
02 pm							
03 pm	<div>arrival in</div> <div>darmstadt</div>	<div>excursion</div> <div>Frankfurt</div>	<div>site inves-</div> <div>tigation</div>	<div>workshop</div>	<div>workshop</div>	<div>crit</div>	
04 pm			<div>workshop</div>				
05 pm							
06 pm							
07 pm							
08 pm						<div>international</div> <div>evening</div>	
09 pm							
		<div>Frankfurt</div> <div>BBQ</div>					







**impressions**

welcoming / excursion FFM / international evening







workshop



## crit & presentations





excursion SW Germany





## excursion SW Germany



miscellaneous impressions









**lecturers**

## lecturers



Prof. Manfred Hegger

The research of Prof. Hegger and his Department focuses on the topics of energy, material, space and process. They investigate areas in eco-balance, criteria in sustainability in competitions, life-cycle considerations, energy and its sustainability, sustainable product development as well as investigating renewable energy concepts in urban and settlement areas.



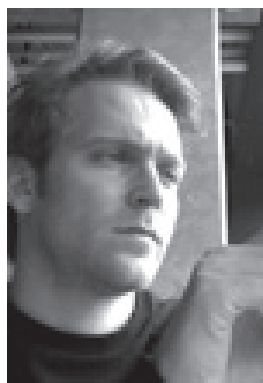
Prof. Christoph Kuhn

Due to the fact that the Department of Prof. Kuhn at the Technical University of Darmstadt is under development, Prof. Kuhn will not be presenting past research activities. He will however, through his position as professor for Sustainable Building and Integrated Design at KIT, give an insightful presentation towards these topics.



Prof. Anett-Maud Joppien

Prof. Joppien's teaching aims at conveying fundamental knowledge within the field of building technology. That incorporates specific ecological, economical and sustainable aspects as an integral part of the design process. Since the fundamental factors of the users well being within a building depend upon the buildings micro climate, its ventilation, lighting and the contact to the outside, as well as the usage of appropriate technologies, the goal is to incorporate and strengthen these parameters at an early stage, via an integrated design process.



Prof. Dr. Martin Knöll

Prof. Dr. Martin Knöll is architect and head of the research group “Urban Health Games” at TU Darmstadt. Knöll investigates evidence-based and health-oriented design with a focus on promoting physical activity, social interaction, inclusivity and mental health in urban environments. Associated to the Design and Urban Development Unit, he closely interacts with computer scientists and health experts to develop context-sensitive media and mobile sensors that enable research into urban health and improve planning processes.



Prof. Dr.-Ing. Peter Gotsch

Prof. Dr.-Ing. Peter Gotsch is an Associate Professor for International Cooperation in Urban Development at the TU Darmstadt. He is a researcher and practitioner and a registered architect focusing on questions of urban development and design in a global context since 18 years. His current studies focus on strategies for better and safer neighbourhoods and public spaces, on privately developed new towns, on urban strategies for refugees and on bridging the gap between research and practice towards sustainable urban development.



Prof. Klaus Daniels

Professor Klaus Daniels is currently the Managing Director of HL-Technik Engineering GmbH, previously he was a Professor at the Technical University of Darmstadt, acting as chair of the „Design and Building Services“. A position which he also held at the ETH Zürich for 14 years, from 1991 - 2006. He specialises in Building Skin Technologies and is as equally renown in Sustainable energy concepts, utilising renewables such as wind power, solar energy, bio gas and bio oil driven CHP, as well as heat pumps and soil energy.

## lecturers



Samuel Thoma

Müller Sigrist Architects was founded 2001 by the architects Pascal Müller and Peter Sigrist. With 30 employees it is now managed by Pascal Müller and Samuel Thoma. Pascal Müller studied at the ETH Zurich and collaborated in the offices of Gigon Guyer Architects and Studio Libeskind. 2010 - 2012 he was professor at the Bern University of Applied Sciences for Architecture, Wood and Civil Engineering. Samuel Thoma studied at the AA Architectural Association in London and since 2006 he is partner in the office of Müller Sigrist Architects.



Dipl.-Ing Arne Steffen

Founder and partner in werk.um architects in 1995. Planning and project development, initiation, co-organizing of 1st sufficiency-congress 2014 in Darmstadt. Workshops, essays, lectures on sufficiency.

A lesson on resource consumption firstly requires motivated users. So far there are hardly any of them. If it is possible though to provide the benefits of resource consumption differently, a more gentle and less harmful lifestyle shall be achievable.



Sabine Djahanschah

Sabine Djahanschah is the head of the unit "Architecture and Construction" at the Deutsche Bundesstiftung Umwelt. She worked at Gerkan, Marg und Partner and since 2003 she is part of the jury for the German "Holzbaupreis". In 2007, she helped work on the Energy Atlas and is, since 2010, a member of the International Advisory Boards. She did her Master's in Building Physics at the TU Stuttgart and is a member of the BMVBS (group of experts of urban preservation).





Sebastian Fiedler

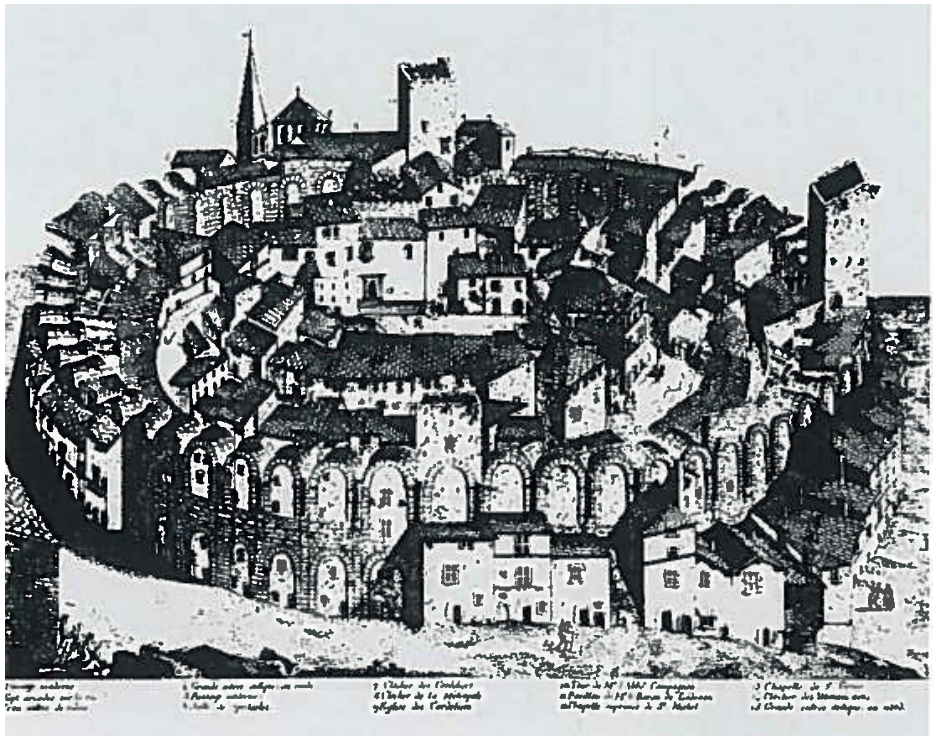
Sebastian Fiedler studied Architecture at the TU Munich and graduated in 2004. After working for different practices in the field of energy efficient architecture he worked as a researcher at the HFT Stuttgart from 2006 to 2010 and became general manager of the „Centre of Sustainable Energy Technology in 2007. From 2008 to 2010 he was project manager of the HFT Stuttgart team for the Solar Decathlon Europe 2010. From 2010 to 2014 he taught „Energy Efficient Building Design“ at the FH Frankfurt and was project director for the SD 2014.



Guillaume Delemazure



**design  
sufficiency strategies  
in urban architecture**



The compact city as ideal type of a city of short distances  
 source: Gunßner, Christoph: Energiesparsiedlungen, München 2000, S.25

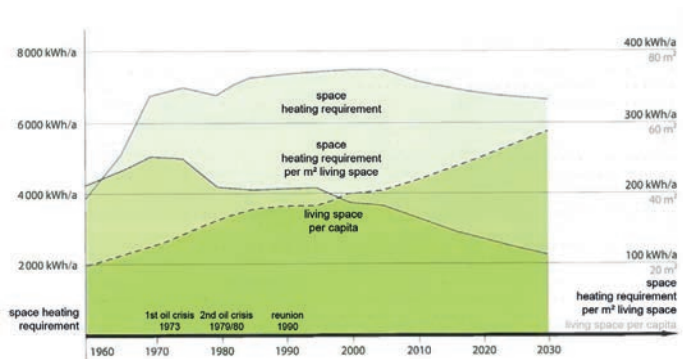
This year's summer school design workshop „sufficiency strategies in urban architecture“ focuses on a sustainable densification of a typical „European City“ Block in Frankfurt. The building site is part of an existing „Gründerzeit“ structure which was built at the end of 19th century. The block itself is situated at the border between a living and an industrial area. Within this tension a strong model for future urban living is to be designed.

The design proposal should conceptually and spatially integrate sufficiency strategies into architecture. Housing hereby is an essential program. This utility is to be combined with another public function needed at that specific plot.

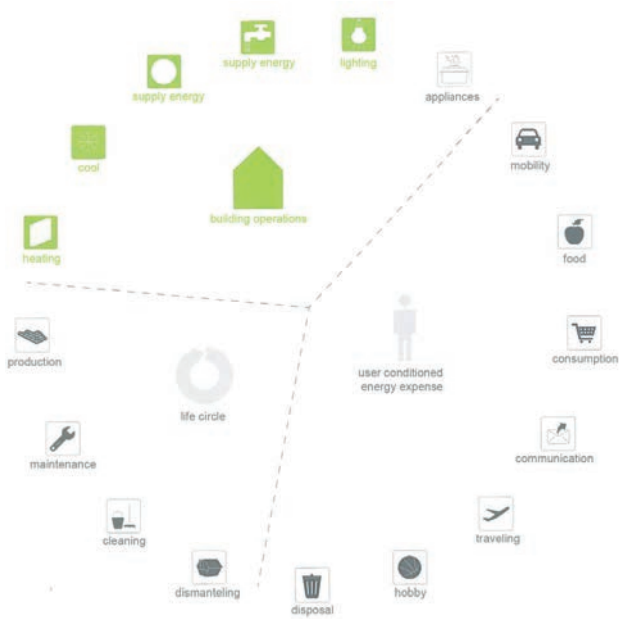
The goal is to incorporate knowledge gathered from expert lectures and exercises into the design. It is important to develop a conclusive method of working within international and interdisciplinary teams in which the complex demands of the design are met and collated to form a homogeneous concept. Challenges due to barriers such as language, architectural approach and cultural differences are expected and are to be handled accordingly.

Architectural concepts must, aside from the creative core task of creating spatial quality, take issues in terms of CO<sub>2</sub> emission, improving micro-climatic effects and the use of natural resources into consideration. New methods and frameworks of sustainable building should not be viewed as an inhabitant of the existing architectural design process but as creative potential that enriches it.

## design workshop



development of the energy demand in Germany after 1945  
source: Hegger et al: Aktivhaus, München 2013, S.64



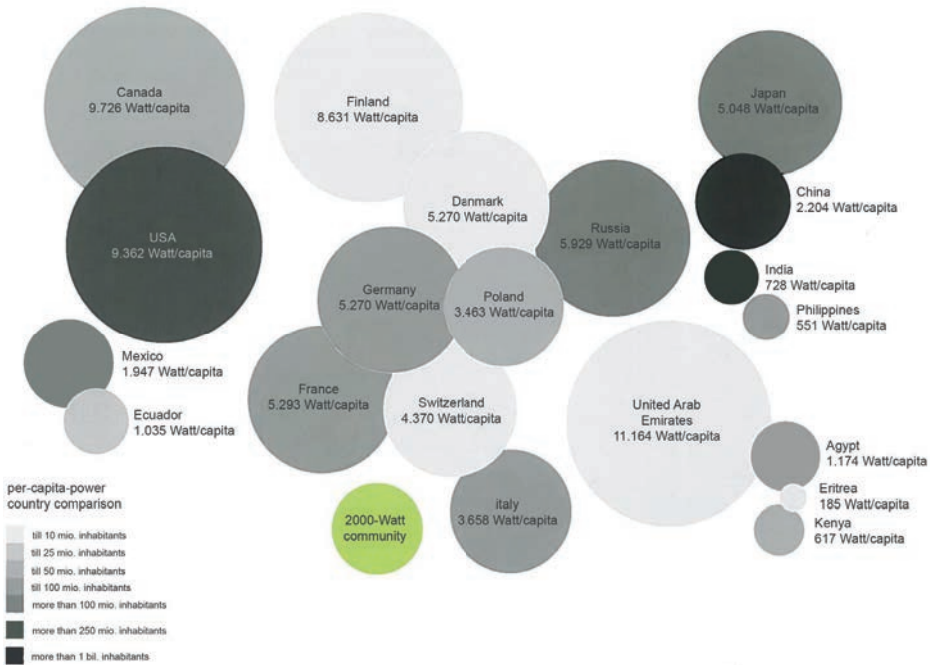
development of the energy demand in Germany after 1945  
source: Hegger et al: Aktivhaus, München 2013, S.64

The building sector in Germany had been focused on the increase of energy-efficient urban and building structures. Simultaneously different changes in the attitude towards social needs negated the efforts of reducing the on the whole energy demands.

This leads to the realization to start to widen the view of acting sustainable by increasing the consideration of the other layers of sustainability. By developing strategies for robustly designed consistent and sufficient structures the goal is aimed to develop towards a sustainable form of society which pursues a holistic view of sustainability.

The development is more and more focused in European discussions about further sustainable development where the task of this year's summer school shall find different approaches how to react sufficiently in a dense urban surrounding.





primary energy consumption per country in relation to the aim of the 2.000 Watt society  
source: Hegger et al: Aktivhaus, München 2013, S.99



Therefor is a need to rethink established standards and concepts to develop a sustainable and trendsetting builded surrounding. The international exchange about the question of how we want to live, work and react in future forms a principal key need.

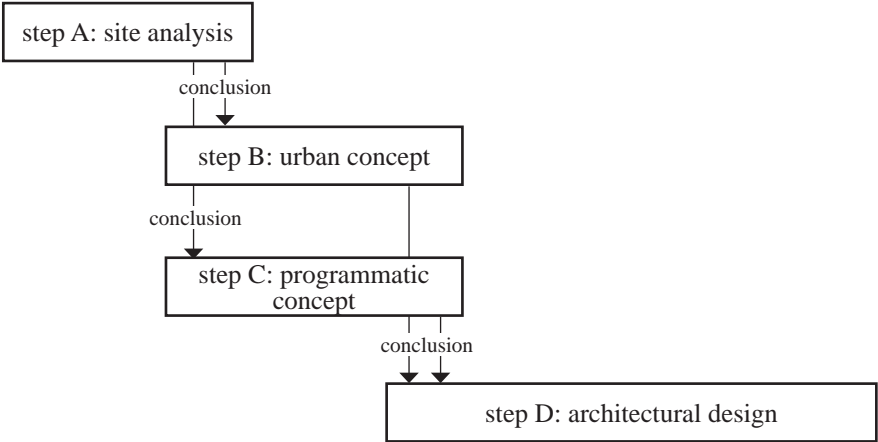
The summer school wants to include different points of view on that international level and want to make a contribution to the current debate.

There are first general signs being picked up to anchor sufficiency into existing processes of building and urban planning:

- Is the way we live and behave adapted to efficient building concepts?
- How much individual space is needed for the different kind of life models and increasing interaction between working and living?
- How much building facilities are needed? Which equipment is useful? What is a abundance of equipment
- Things shall be converted and reused, the question is how can it be reacted?
- How much individual mobility is needed?
- Shall we share and exchange things to reduce our demands? What does it mean for society?

What is your opinion about sufficiency? Find new answers to the question of how a sufficient housing could look like?

design workshop



The design task is structured in four steps. Each step is related to the others and has to be developed carefully. In order to the short time frame it is necessary to succeeded each step in time.

Step A (site analysis) should be finished within the first two days of the design workshop. Step B (urban concept) and step C (programmatic concept) are to be built on the results of the analysis (step A). The urban and programmatic concept are the basis for the following architectural design. Therefore the two steps should be completed until the third day of the design workshop. They are to be developed with an overlapping of step A.

A first milestone is defined by the crit 1 on Friday 24th. A first architectural proposal should be shown by models, diagrams, sketches of floor plans and sections. An advanced development to this stage is essential for a successful completion of the whole workshop.

After the excursion two days remain to further develop the architectural design. A second milestone is defined by crit 2. This second crit will be hold on Wednesday. After that, all design teams should start finalizing the overall project. This includes layout and presentation.

Both Subtasks A and B are tackled within a group. Each group must organize itself accordingly in order to have a goal-oriented focus and to make efficient use of time.

In both Subtasks, an intensive analysis must be made in order to improve the understanding of the task and the area context. This will be the basis to work with during the design. The concept and design outcome are to be portrayed in appropriate methods of presentation (floor plans, sections, views, sketches, diagrams, etc.).

It is essential that the development of all parts of the urban and architectural concept correlate with the results of the analysis and the followed sufficiency strategies.



**site**





photos: Christoph Drebes

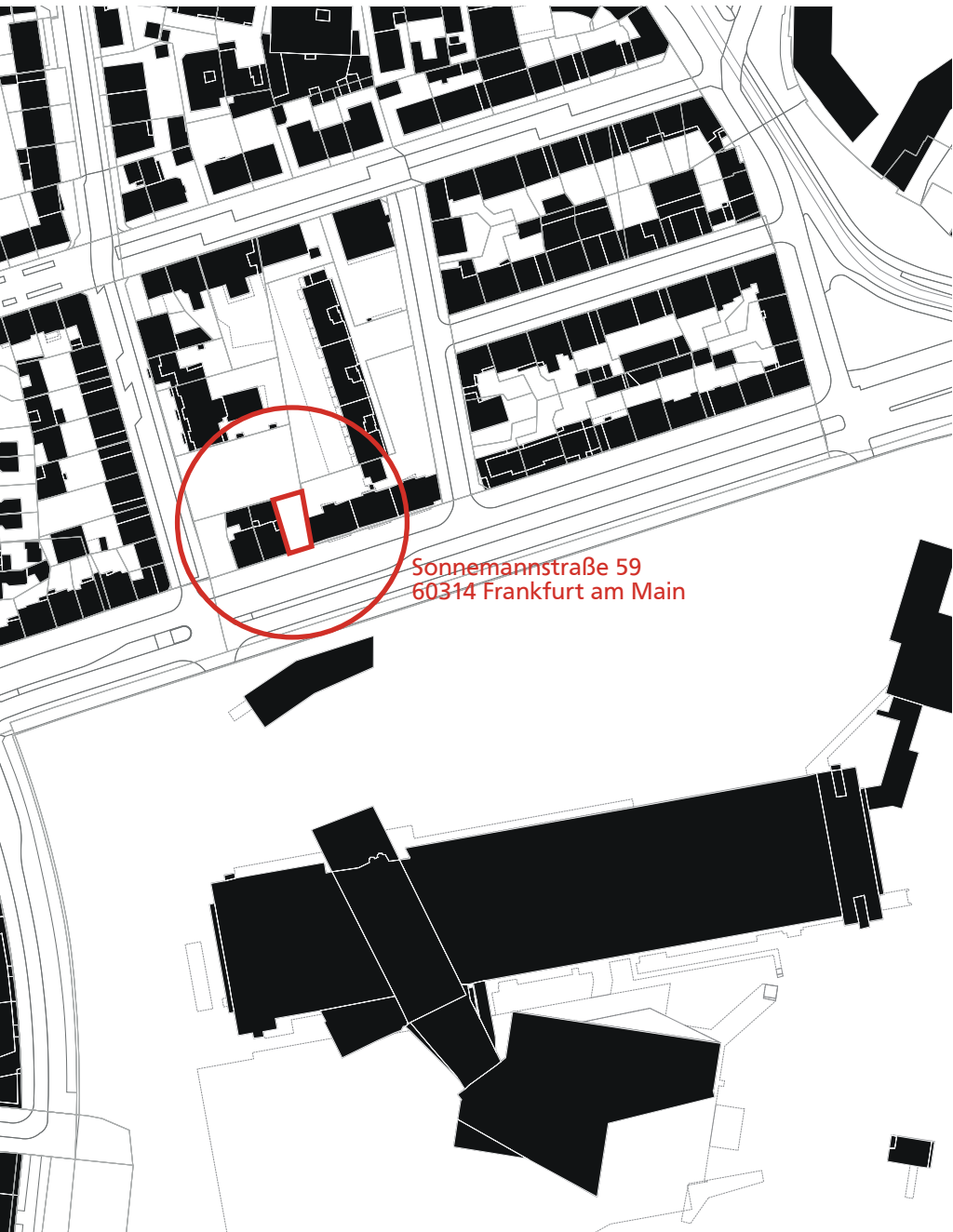








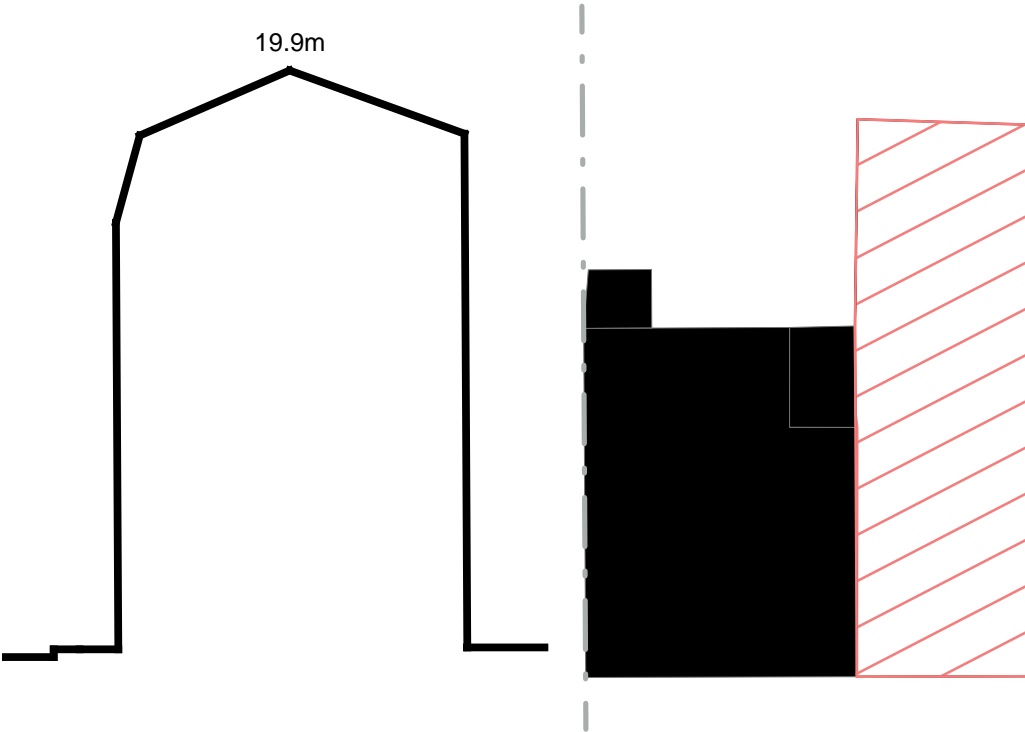






step D: architectural design











photos: Christoph Drebes

# **step A: site analysis**



photos: Christoph Drebes

The first step is to perform a systematic analysis of the site and its surrounding. Designers should identify specific characters of the situation and its individual „logic‘. A solid analysis is the basis of the following design task.

The analysis is vital in order to understand the original design concept and to identify programmatic, spatial and energy development potential (lack of use, new programs, etc.)

Hereby, all aspects of the site from its urban environment to programmatic aspects and building details must be taken into consideration. The following topics are to be analyzed:

- existing spatial concept and program of the urban context
- identifying potential lacks of programs and utilities
- specific building types
- inner and outer access systems
- typical materials that define this place
- characters of open and green spaces
- climatic conditions (course of the sun, temperature curve, precipitation, humidity)

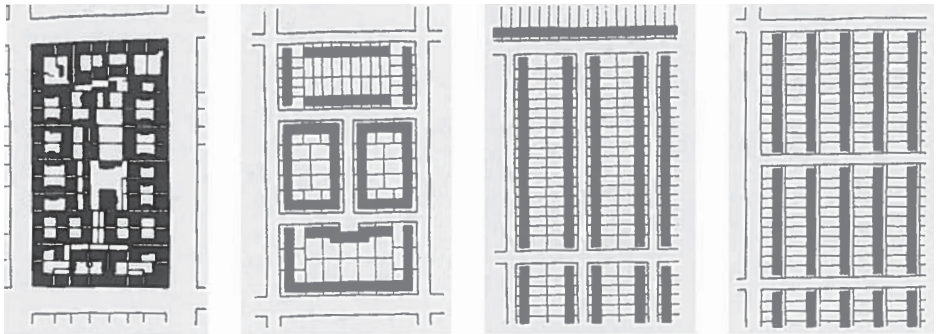
To be submitted:

- Explanation of the main site characters, existing and missing programs, spatial situations and main typologies
- Mass model of the site including the direct surroundings

Materials:

sketches, diagrams, text, model, collages, fotos, videos, etc.





different city types: mega block, block, back-to-back line structure, equal line structure  
 source: Gunßner, Christoph: Energiesparsiedlungen, München 2000, S.22

**step B:**  
**urban design concept**

design workshop



source: GoogleEarth



The second step is to create an urban design concept using the knowledge gathered during the analysis. Here, possible solutions in terms of integrating a new building structure by increasing the programmatic qualities of the quartier and „finishing“ the block must be found.

The amount of structural densification should be planned according to each individual analysis. Also the position and evaluation of a new volume had to be designed carefully and should show its compatibility with the existing area through a model. The proposed new buildings must cohere with the overall logic of the context.

The Design of step B must continuously be developed parallel to step C to check and ensure a homogeneous overall concept.

The new proposed building is to be shown in the model and in the site plan (view). They must however have typological diversity between existing and new structures. As design method the production of a series of mass models are strongly recommended. Therefore we propose to develop variations within a volume study.

The base of the concept is a sufficiency strategy for cities that follow an interior instead of exterior developments. This must determine the unique and strong characteristic of the typical „Gründerzeit“ Block.

The following topics are to be focused on:

- Which density is acceptable for that place?
- Elevation (concentration, visibility, compactness, height, etc.) of new volumes,
- How do proposed volumes fit into the existing spacial situation? How do existing and new structures come together?
- access of existing and new structures
- priorities of open spaces (public, semi public, private)



Grünfläche Wohnen



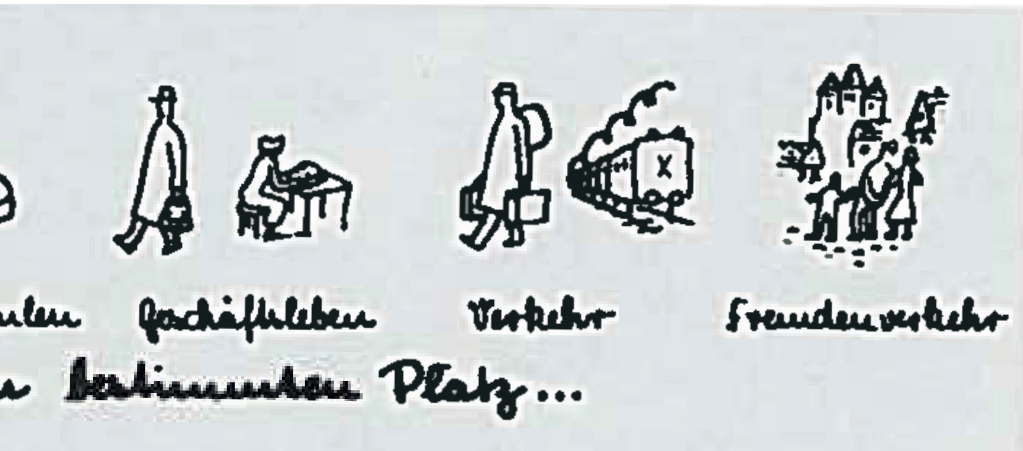
Arbeit



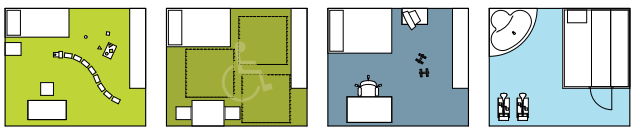
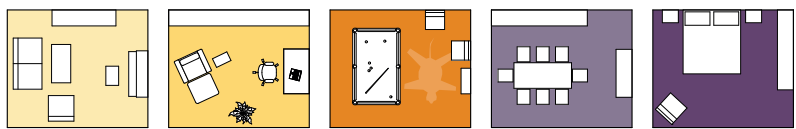
Erholung Sport

... jede Funktion hat ihren

main programs within a city - ideal of separating functions after 1945;  
source: Günzner, Christoph: Energiesparstädte, München 2000, S.24



step C:  
programmatic concept



flexibility in space  
source: p.a. / Steffen Wurzbacher

A programmatic concept is to be developed in addition to perceptions of the site analysis. Program and Volume directly interact and influence themselves. Therefore both steps have to be solved simultaneously.

The main program of the design task is innovative housing. In addition to that a second program has to be integrated. Type and size of the additional program is to be argued from the results of the site analysis (step A). This „public“ utility should create a benefit for the surrounding quarter. The housing typology is to be designed in connection to sufficiency strategies told during the daily expert lectures.

Herby following questions and topics should be in focus:

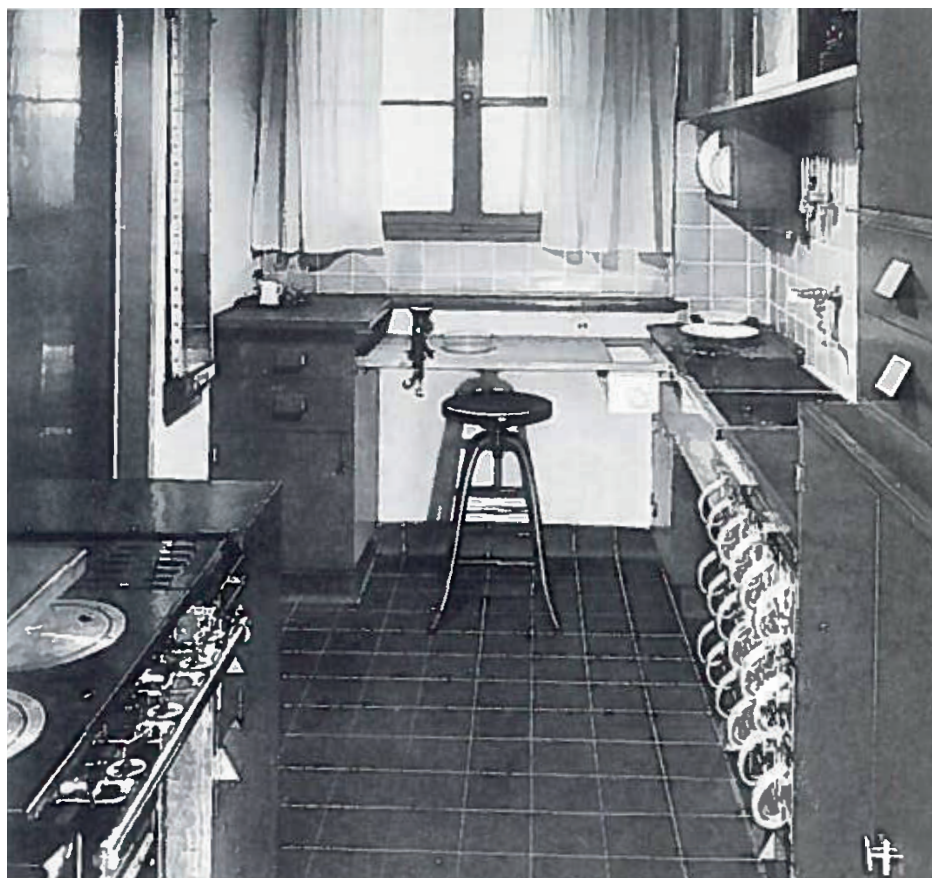
- How will daily routines of children, young and old adults be organized in the future? How does future housing and working look like?
- What spacial demands result out of daily routines of inhabitants?
- Which utilities can be combined, left over or reorganized?
- Flexibility and neutrality as main character of space
- Which additional programs create benefits for the surrounding quarter?
- How are these two programs structurally organized? How do they interact?

To be submitted:

- Explanation of the organization of planned programs
- Description of chosen sufficiency strategies
- Description of the interaction between housing and additional program
- Description of the main character of the developed program

Materials:

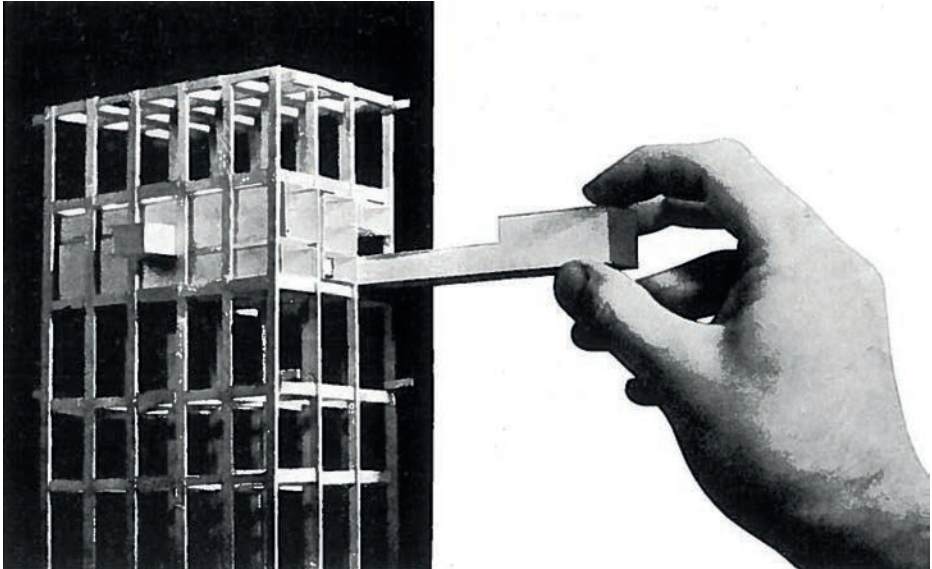
sketches, diagrams, drawings, text, collages, fotos, videos, etc.



„Frankfurt Kitchen“ from Ernst May (1926) as first example of space efficient design  
source: Förster, Wolfgang: Housing in the 20th and 21st Centuries; München / Berlin / London / New York 2006, S.39

## **step D: architectural design**





source: Boesiger; Girsberger: Le Corbusier 1910-65, Zürich 1986

The last and main step is to develop an architectural design proposal based on the previously defined urban and programmatic concepts. Hereby all essential parts of the building need to be designed and shown in plans, sections and elevations.

One representative Housing Unit is to be further developed. The main aspects of chosen sufficiency strategies should be integrated in this spacial translation.

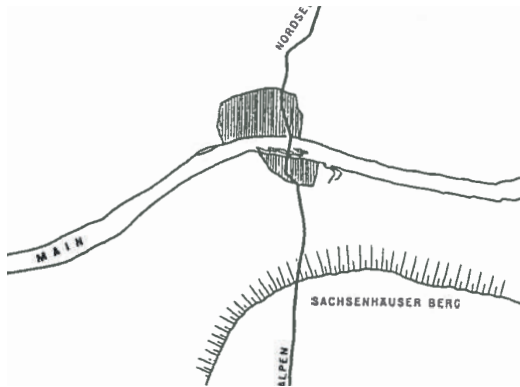
Despite to the design of the building structure a second focus concentrates on the facade. This element defines the transition between inside and outside as well as a climatic zones. In addition to a visual character main functions (construction, insulation, ventilation, daylight, solar energy gains, etc.) should be qualitatively described. Facade concepts should show passive and active energy strategies. In addition to that potential energetic zones should interact with the developed sufficiency concepts within the spacial figure.

Hereby the following topics should be focused on:

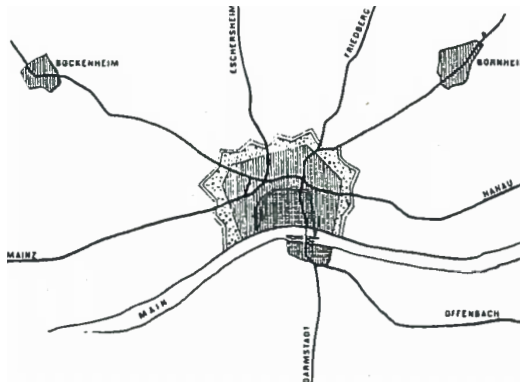
- How are the housing units structured? Are there zones and hierarchies?
- That is the spacial structure of the building?
- What kind of construction and construction principle is to be chosen?
- What kind of materials are used inside?
- What main energy demands are to be expected? How is the energy supply solved?
- How is the facade structured?
- What kind of character does the new building have?
- What kind of materials are used in the facade?



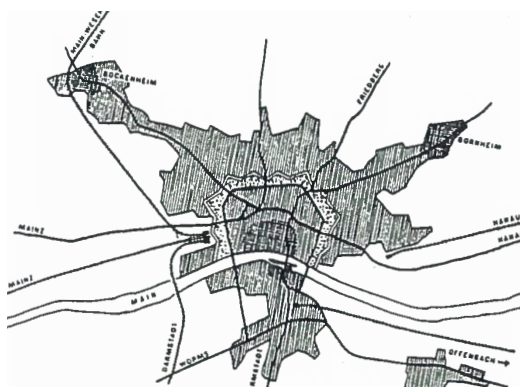
**frankfurt,  
historic development  
& topography**



first settlements „compact medieval city“



14th - 17th century „defence installations as limitation“



19th century: „railroad city“

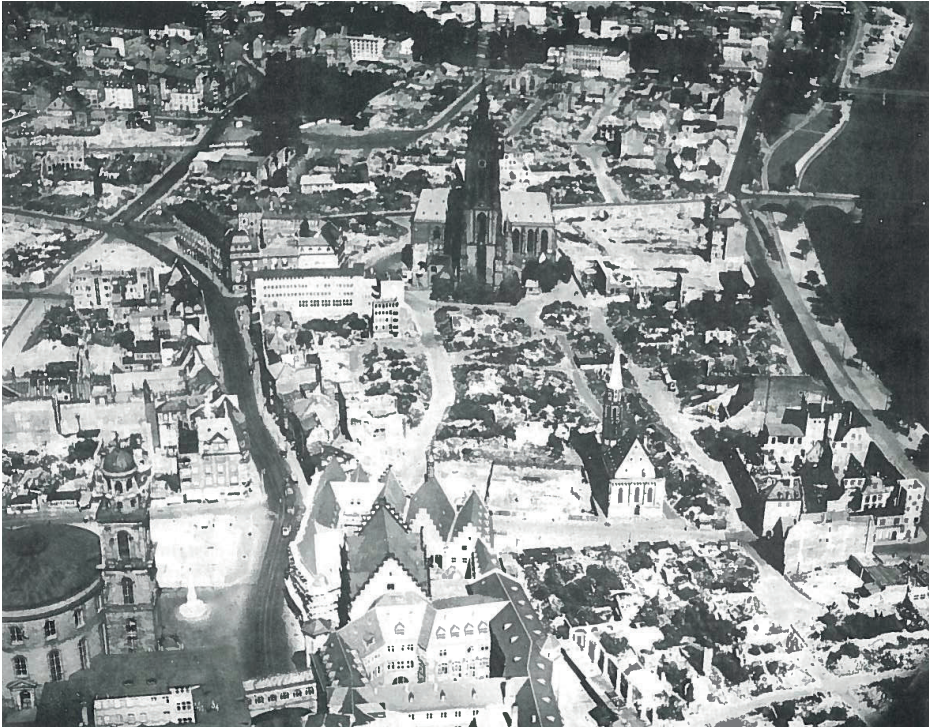
## frankfurt, historic development & topography



1947 - begin of the „sprawl“

historic development of Frankfurt

source: Frankfurt am Main: Stadtentwicklung und Planungsgeschichte seit 1945, Frankfurt 1996; S.19



Frankfurt city centre in 1945  
source: Frankfurt am Main: Stadtentwicklung und Planungsgeschichte seit 1945, Frankfurt 1996; S.19



## frankfurt, historic development & topography

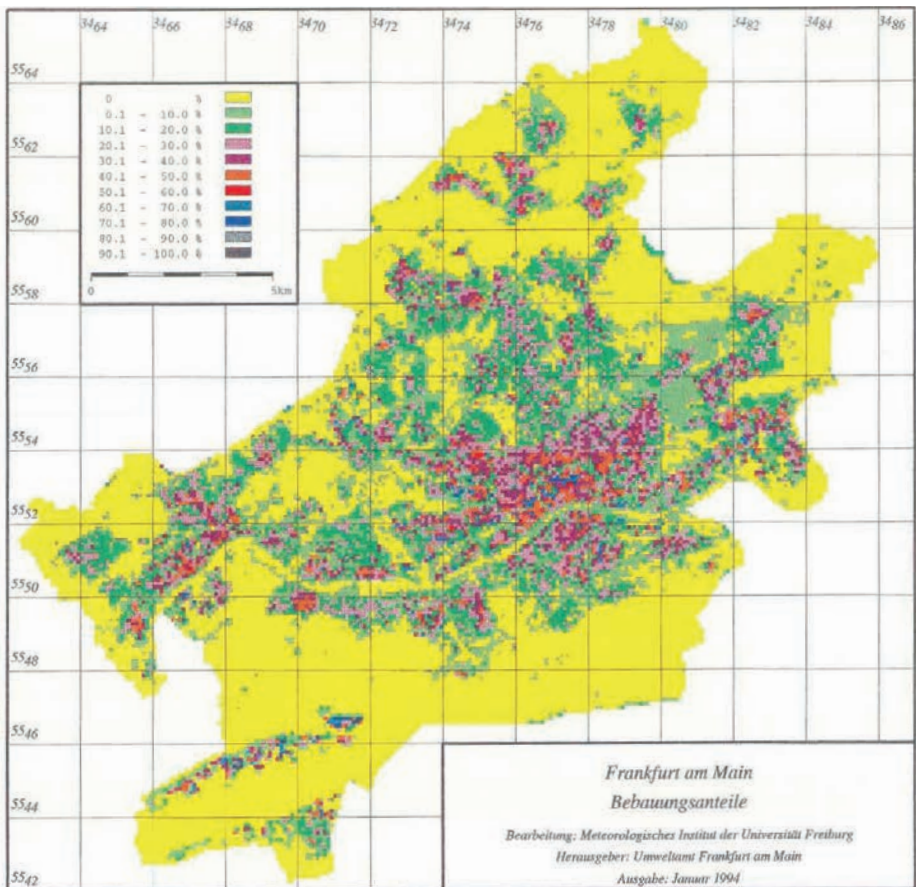


## design workshop

### morphology

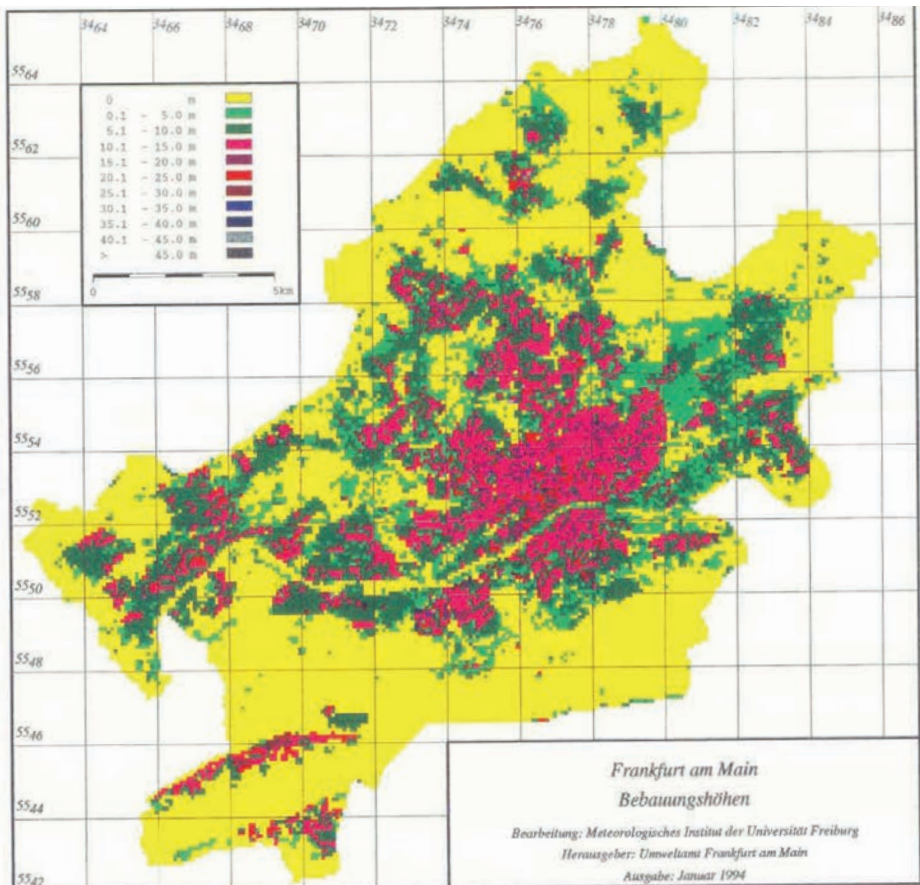
the inner city is mainly sealed with a minimum of green spaces (l.)

the typical height of the densed parts is between 20 to 24 metres (r.)



source: Mayer, Fritsch, Matzarakis: Ausarbeitung von Karten der stadtklimarelevanten Luftleitbahnen in Frankfurt am Main, Freiburg 1994, S. 23

## frankfurt, historic development & topography



source: Mayer, Fritsch, Matzarakis: Ausarbeitung von Karten der stadtklimarelevanten Luftleitbahnen in Frankfurt am Main, Freiburg 1994, S. 24

## design workshop

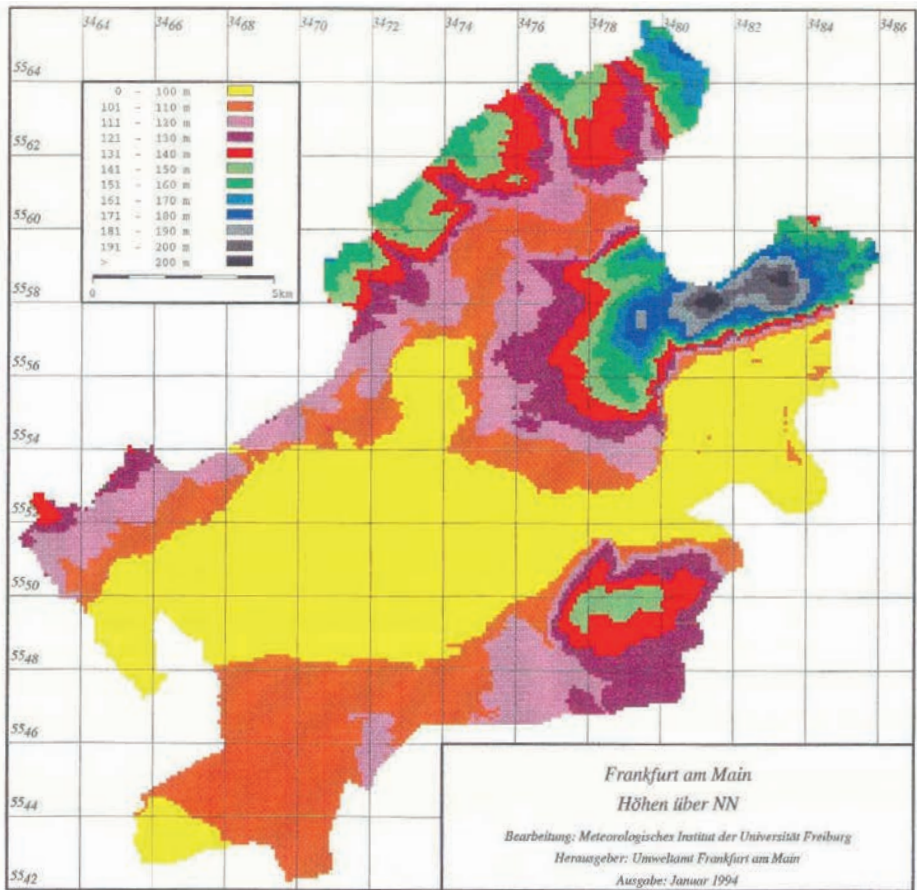
### topography

City centre + Sachsenhausen: situation on

both sides of the river Main

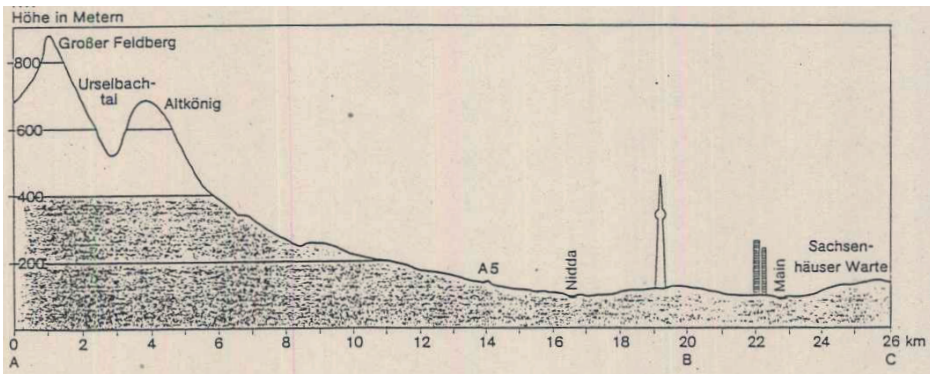
North: hills of the Taunus

South: hills of the Odenwald



source: Mayer, Fritsch, Matzarakis: Ausarbeitung von Karten der stadtklimarelevanten Luftleitbahnen in Frankfurt am Main, Freiburg 1994, S. 10

## frankfurt, historic development & topography

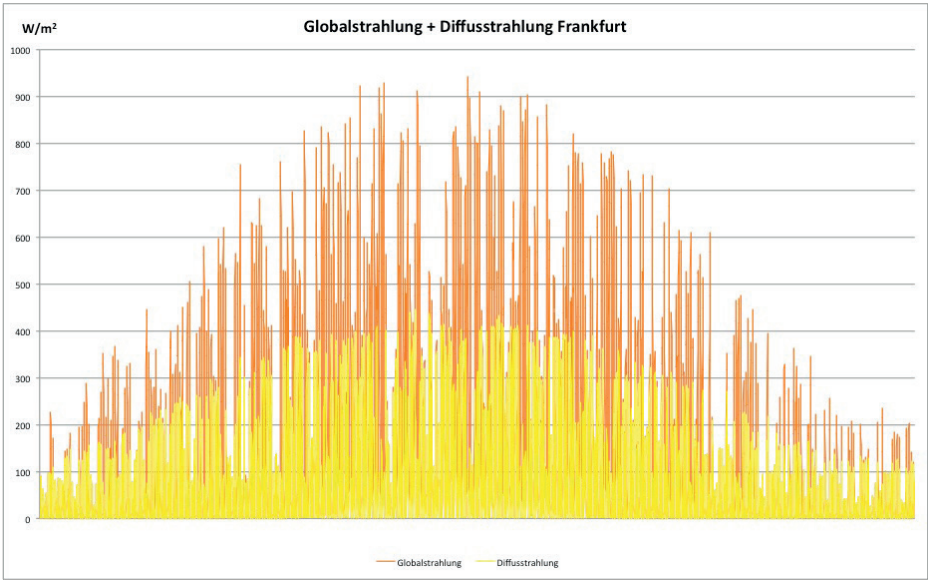


source: Mayer, Fritsch, Matzarakis: Ausarbeitung von Karten der stadtklimarelevanten Luftleitbahnen in Frankfurt am Main, Freiburg 1994, S. 09

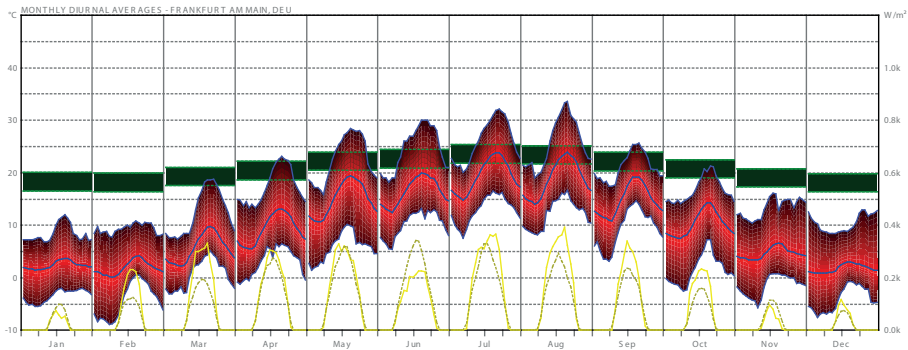


# **Frankfurt, climatic situation**



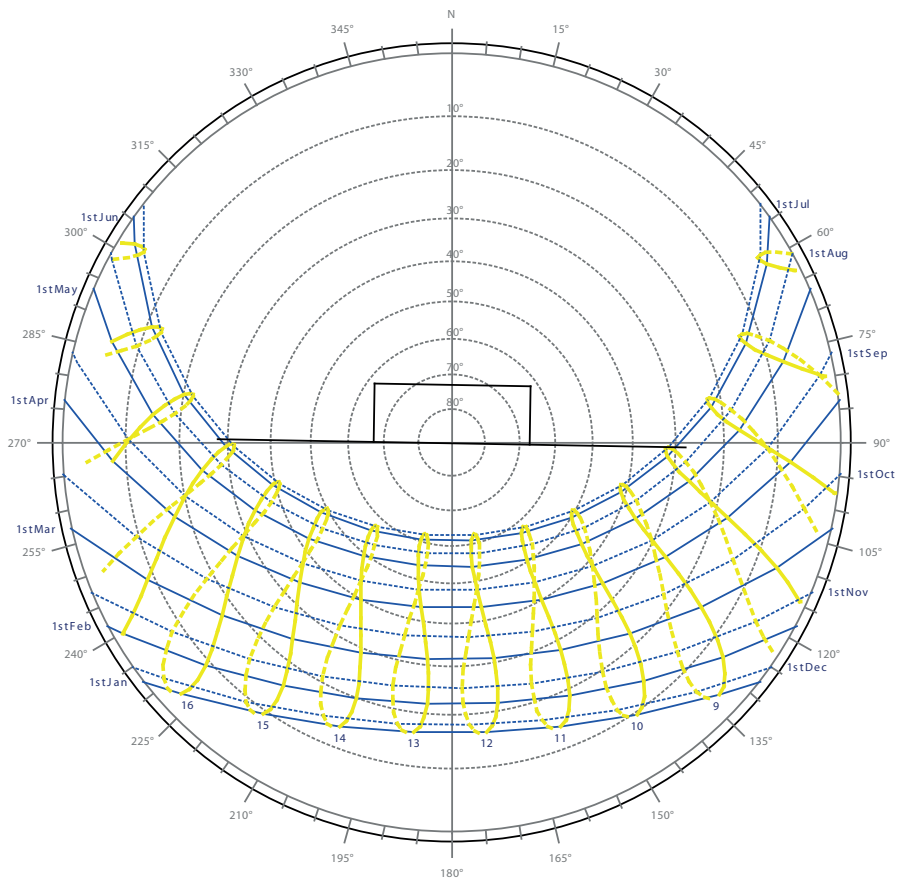


solar radiation  
source: EcoTect



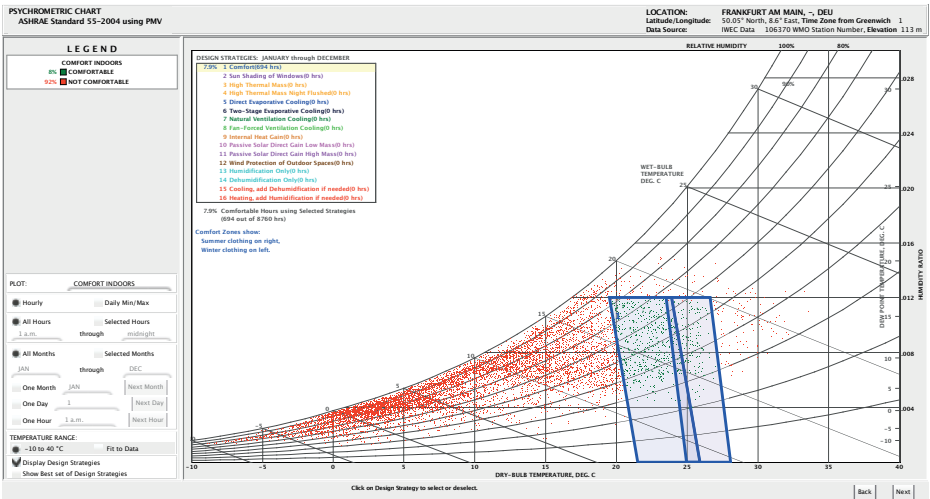
average monthly temperature  
source: EcoTect

Frankfurt, climatic situation



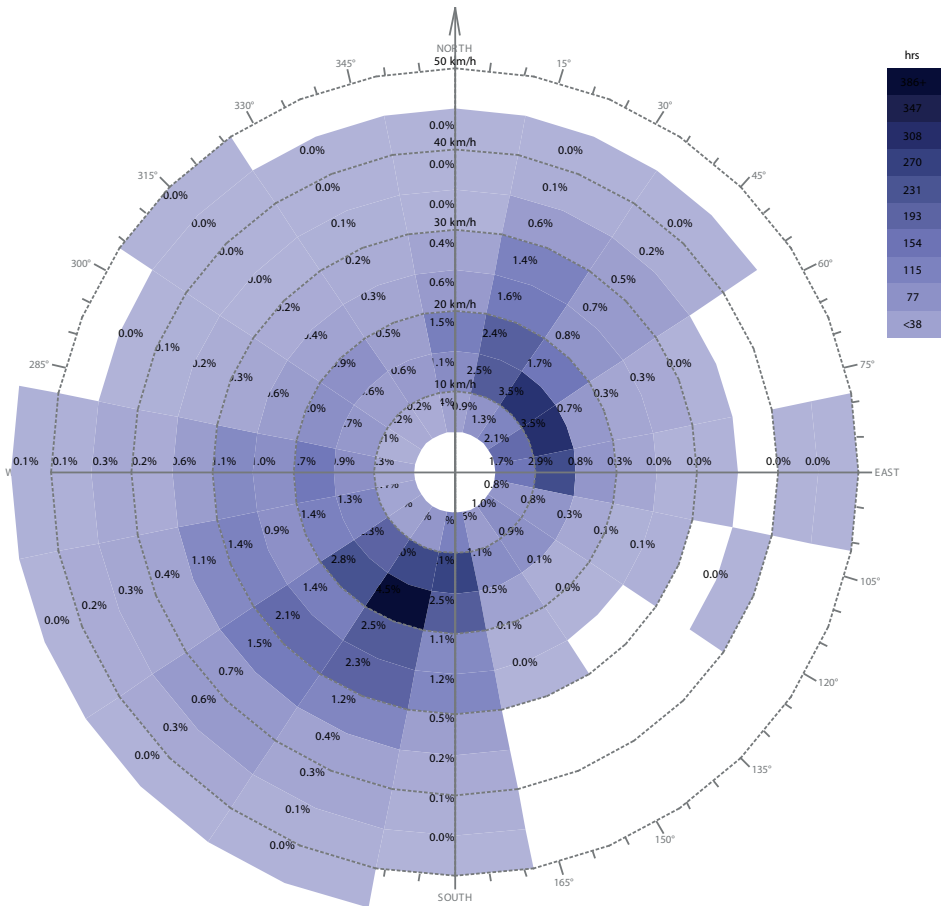
sun elevation chart  
source: EcoTect

design workshop

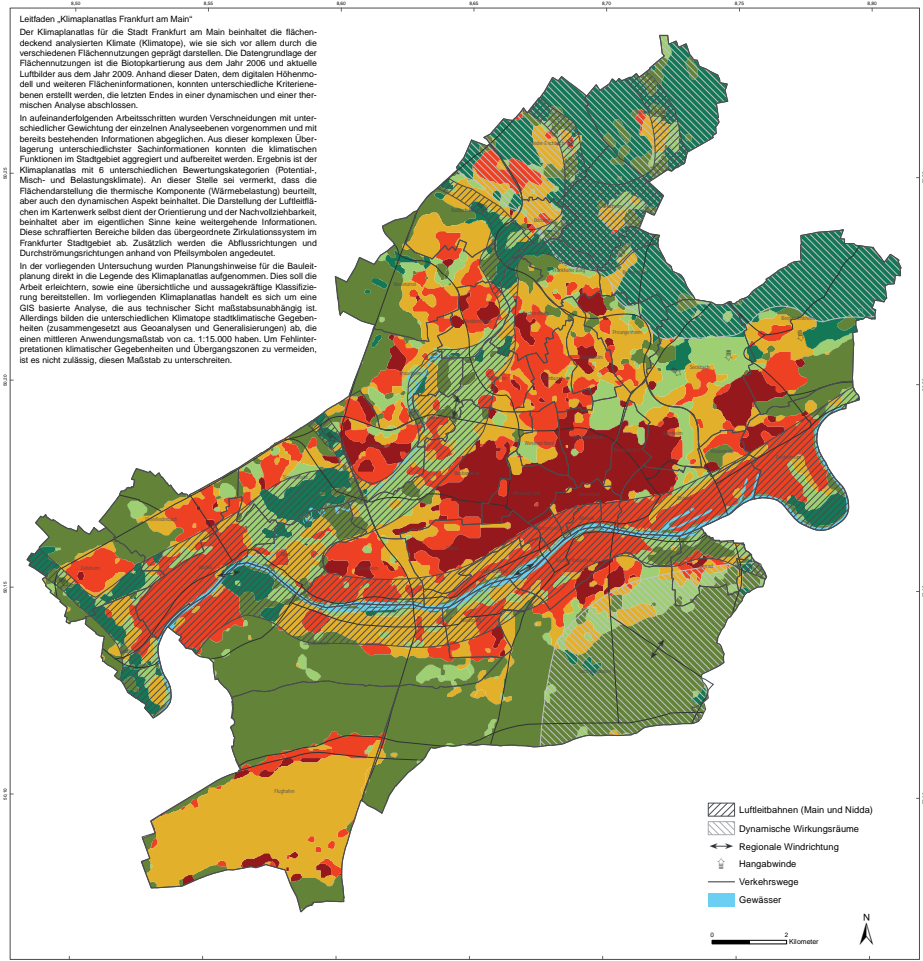


psychrometric chart  
source: Climate Consultant

## Frankfurt, climatic situation



wind rose  
source: EcoTect



climatic situation:

the inner city of Frankfurt is built in a compact high dense morphology. Narrow streets and a minimum of green spaces cause heat island effects during summer times. Forecasts show rising risks of overheating and reductions of ventilations.

The site of the design task is at the border between the ventilation corridor of the river Main and the dense inner city structures.



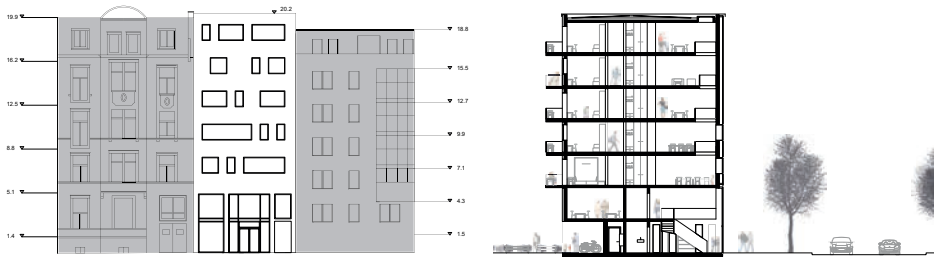
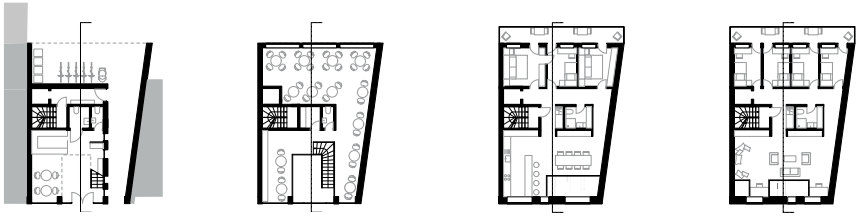


## student works

results of the design workshop

design 1	Pöschel, Viala, Vasquez
design 2	Baiao, Rodrigues, Cesar da Costa e Silva
design 3	Daniswara, Erosa, Duff de Azevedo
design 4	Simao, Andini, Jin
design 5	Wihertinindia, Sinelli Sobreiro, Prasanti
design 6	Noviano, Putra, Tao
design 7	Moraes, Dastoli, Caraud
design 8	Francisco, Evitasari, André
design 9	Syahnovy, Costa Sousa, Godinho Vaz
design 10	Amalina, Bellotti
design 11	Sampaio Encinas, Atanasova, Madinier
design 12	Tirta, Katayama, Zhang
design 13	Frazzatto, Gaspar, Hutasuhut

## design project 1



### group

Gladys Vasquez (gu)

Veronika Pöschel (de)

Adha Viala (id)

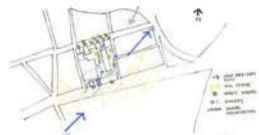
building levels



land use patterns



climatic conditions



open and green spaces



traffic and noise

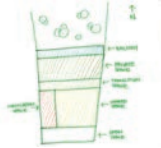


building typologies

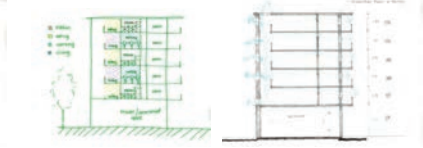


A NEW LIVING  
A NEW FAMILY  
shared space concept

space layers



section



PHOTOVOLTAIC



BIOMASS TREATMENT



BIO-GAS (not leaving the building)



BIO-WASTE



CONTAMINATED LAND REUSE



GAS



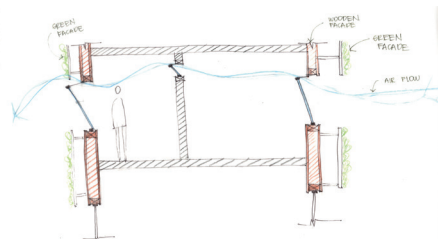
HEATING



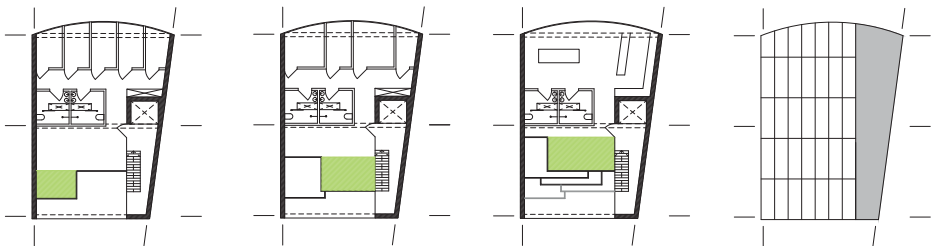
WATER



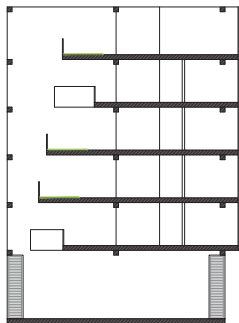
ACTIVE SOLUTIONS



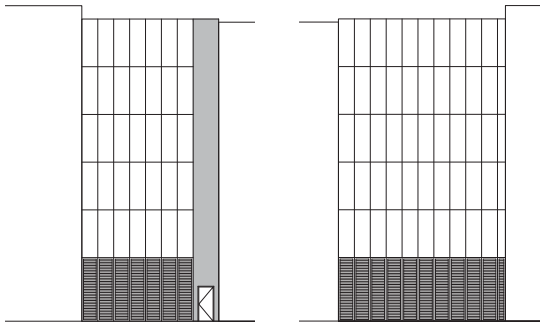
# design project 2



campus structure with a new center



section

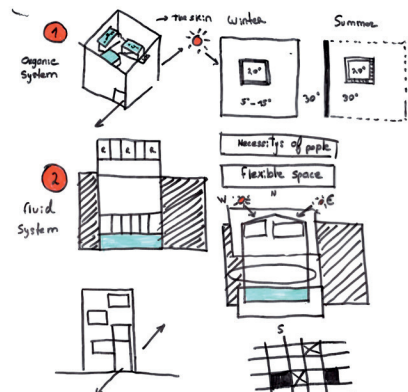
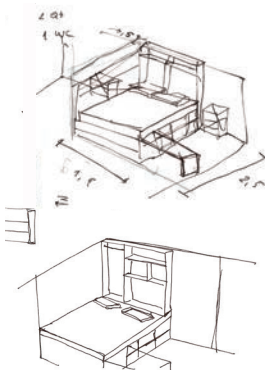
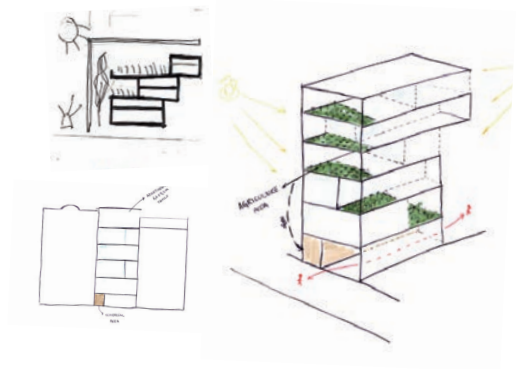
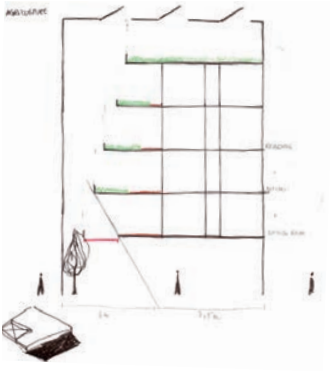
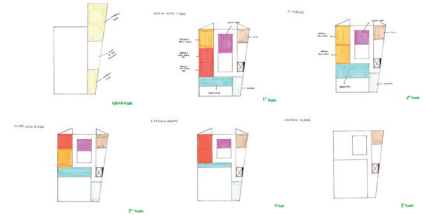


view

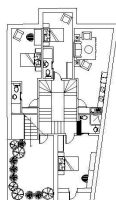
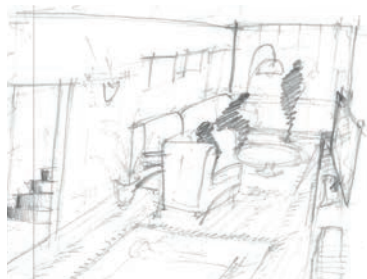


## group

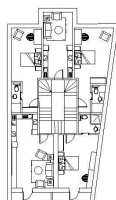
- |                 |      |
|-----------------|------|
| Sara Baiao      | (pr) |
| Joana Rodrigues | (pr) |
| Gabriel César   | (br) |



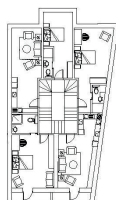
# design project 3



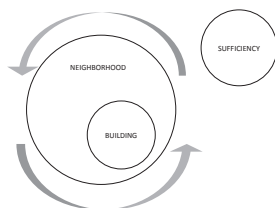
ground floor



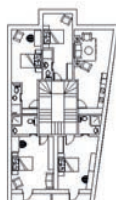
2nd floor plan



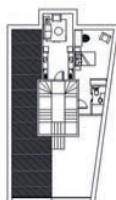
3rd floor plan



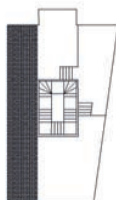
divide and conquer



4th floor plan



5th floor plan

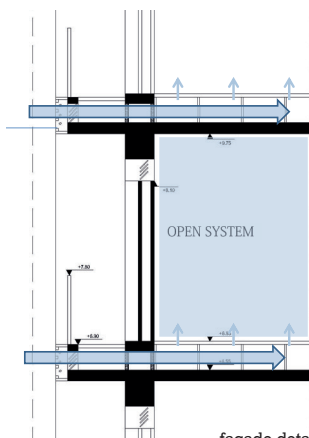
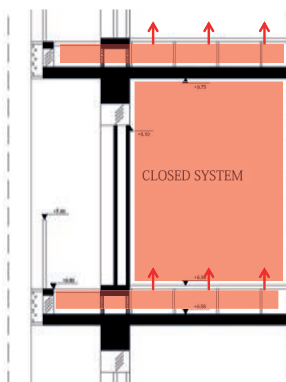
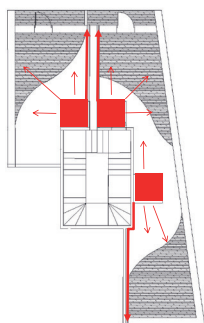
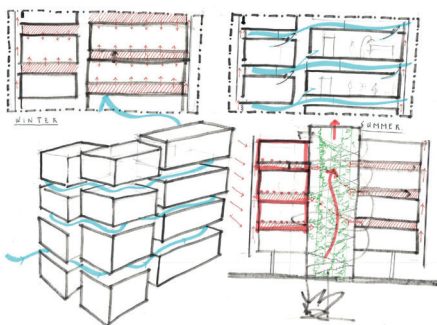
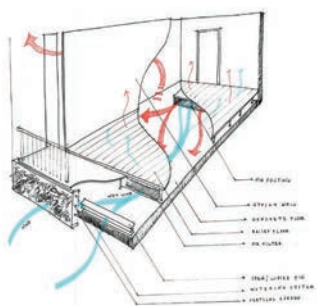
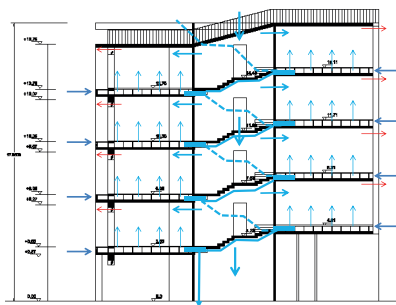
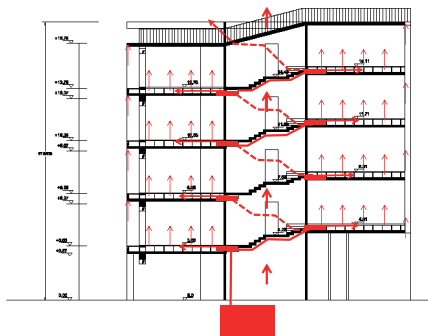


roof plan



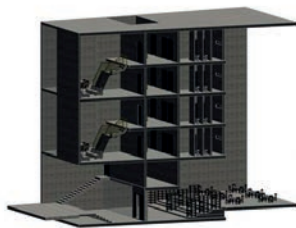
## group

- Elvia Erosa (mex)
- Frederico Duff (br)
- Reza Daniswara (id)





## design project 4



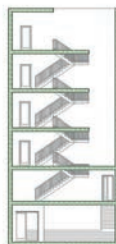
ground plan



apartments plan



section A-A'



section B-B'



SECTION B-B'

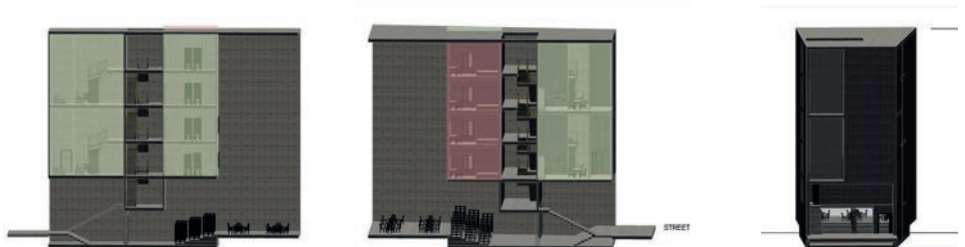
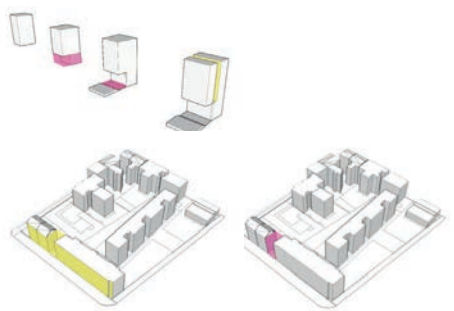
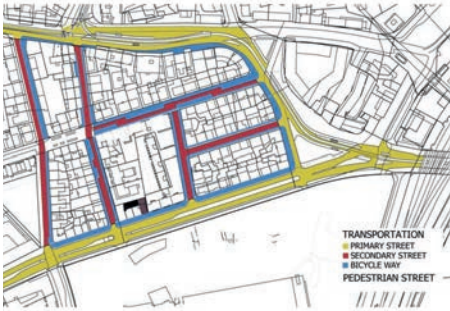


### group

Zahra Rizkia Andini (id)

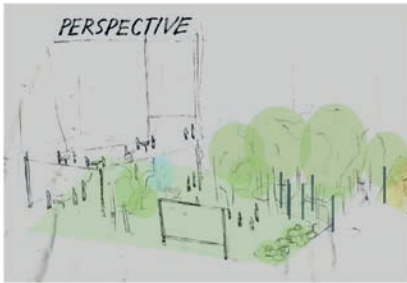
Bo Jin (de)

Carolina Simao (br)

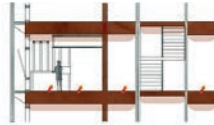


activated atrium and added studio spaces

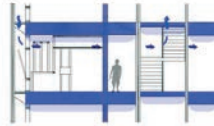
## design project 5



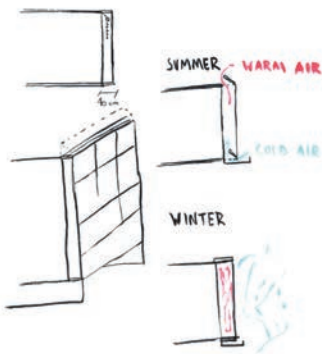
THERMAL MASS -  
SUMMER



THERMAL MASS -  
WINTER



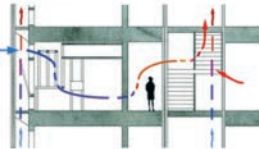
SCALE: 1/4" = 1'-0"



VENTILATION  
DOORS OPEN

STACK EFFECT

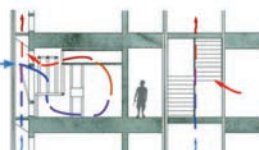
CROSS-  
VENTILATION



VENTILATION  
DOORS CLOSED

STACK EFFECT

CROSS-  
VENTILATION



## group

Mutiara Wihertinindia (id)

Sabrina Sobreiro (br)

Nabila Antari Prasanti (id)



restructured center and public transport system

	S	W	O	T
LAND USE AND LANDSCAPE		1. PLOT TRANSITION SHAPE.		
CIRCULATION AND PARKING	1. BICYCLE LANE 2. PARKING AVAILABLE ON THE ROAD SIDE.	1. HEAVY TRAFFIC IN FRONT OF THE SITE.		1. NOT ENOUGH PARKING SPACE.
ACTIVITY SUPPORT	1. LOTS OF FACILITIES: OFFICE, BANK, SCHOOL, COMMUNITY COLLEGE & SHOPS, BUS.			1. NO PLACE TO GATHER PEOPLE TOGETHER.
BUILDING AND MASSING				1. FUTURISTIC BUILDING ON THE ACROSS OF THE SITE. 2. SQUARE SHAPES.
SIGNAGE				
OPEN SPACE			1. SHOULD MAKE MORE OPEN SPACE FOR PEOPLE GATHERING.	1. NO OPEN SPACE
PRESERVATION.			1. BUILDING CHARACTERISTICS OF POST WAR & MODERN CLASSIC, ATTRACTS TOURISTS.	1. <u>CAN'T MAKE</u> PRESERVE THE OLD BUILDING'S STYLE.

## design project 6

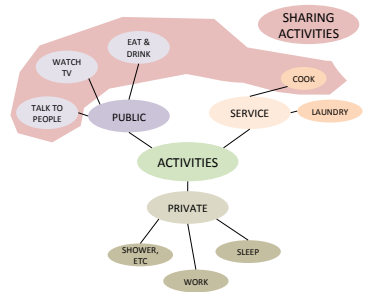
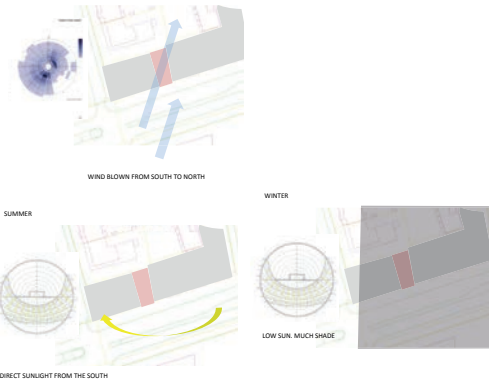
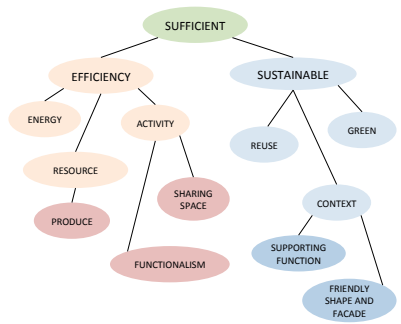


### group

Chen Tao (pr)

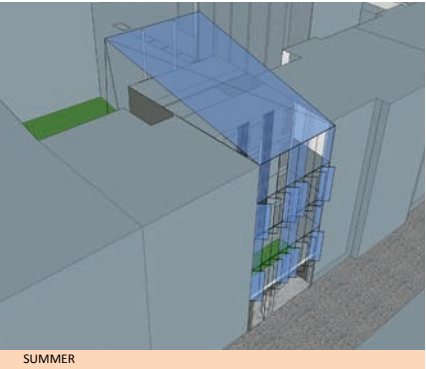
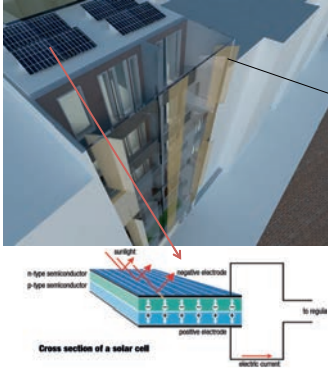
Finsa Hutama Putra (id)

Harly Valiant Noviano (id)

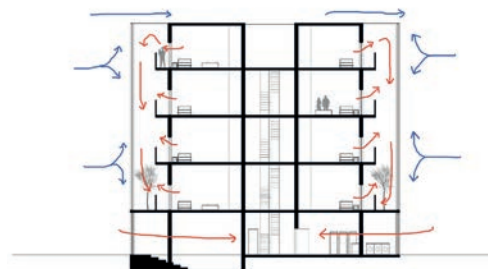
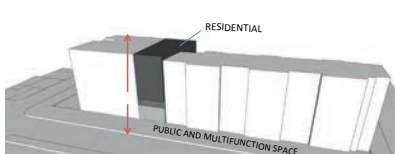
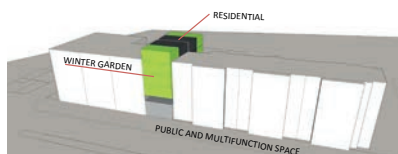
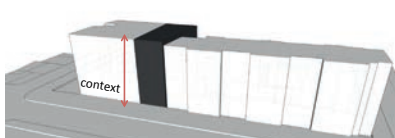
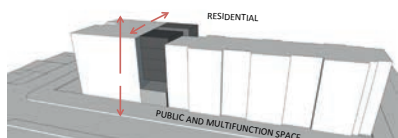


	S STRENGTH	W WEAKNESS	O OPPORTUNITY	T THREAT
LANDUSE	RESIDENTIAL FUNC. NEAR SCHOOL AND OFFICE BUILDING	TRAPEZE SHAPE (NON FUNC. SHAPE)	BUILD A RESIDENTIAL WITH PUBLIC ACTIVITIES	NOT MUCH SOCIAL ACTIVITIES AROUND SITE
CIRCULATION AND PARKING	290M FROM BUS STATION	NO PARKING AREA		
ACTIVITY SUPPORT	NEAR OFFICE, BANK, COMMERCIAL BUILDING, SCHOOL	HAVE NO PLACE FOR PEOPLE TO GATHERING	SUSTAINABLE BUILDING WHICH CAN CONNECT, SUPPORT THE FUNC. AROUND THE SITE AND FULFILL OUR NEEDS	
BUILDING AND MASSING	STRONG NEO- CLASSIC STYLE	CANT MAKE DIFFERENT STYLE BUILDING SMALL SITE MUCH SHADE IN WINTER	BUILDING THAT USE ENERGY OF THE SUN AND WIND	SUNLIGHT CAN GET REACH INSIDE THE BUILDING IN WINTER
OPEN SPACE	HAVE OPEN SPACE IN THE BACK OF THE SITE		GROUND FLOOR SHOULD BE PLANNED FOR OPEN PUBLIC SPACE	MORE PUBLIC SPACE, LESS PRIVATE SPACE
SOCIAL	PEOPLE CAN MEETS AT THE SHOP/RESTORAN NEARBY THE SITE	NO PUBLIC OR SOCIAL ACTIVITIES	MAKE A PLACE WHICH CAN GATHER PEOPLE	
PRESERVATION		CONTEXT BUILDING	CREATE CONTEXT AND SUSTAINABLE BUILDING STYLE	







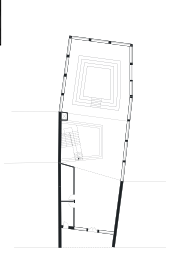


WINTER



SUMMER

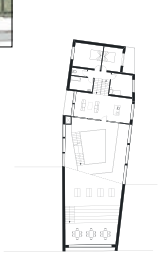
design project 7



ground floor



1st floor



2nd floor

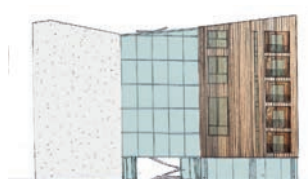
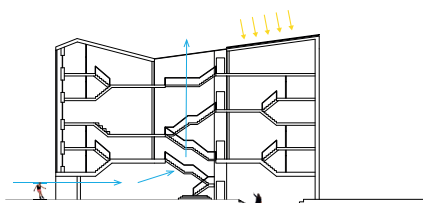


4th floor



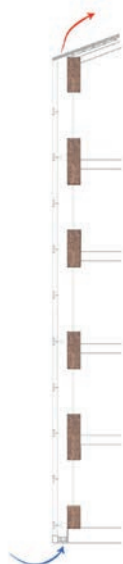
group

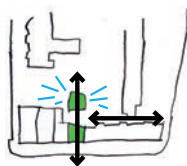
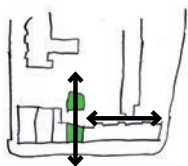
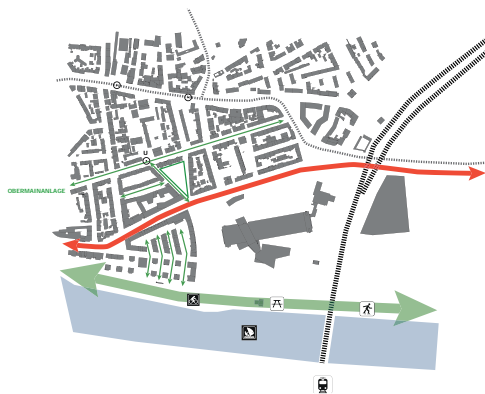
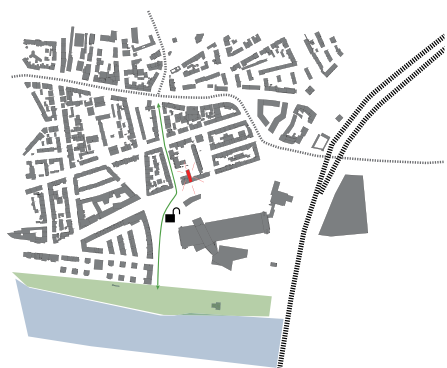
- |                 |      |
|-----------------|------|
| Stefano Dastoli | (de) |
| Camila Moraes   | (br) |
| Pierre Caraud   | (fr) |



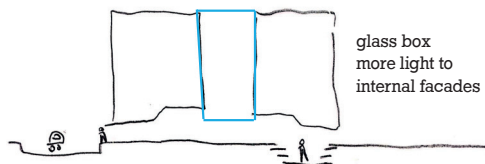
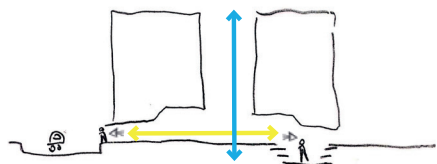
west facade

east facade

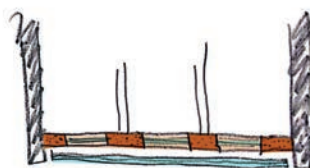
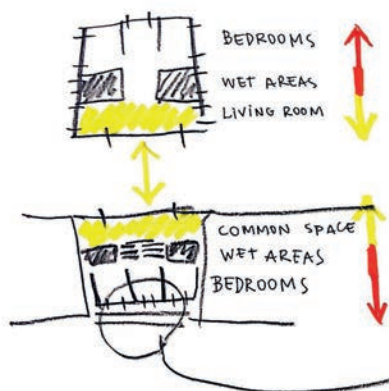




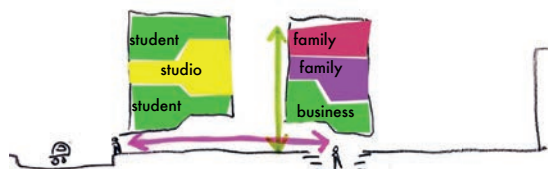
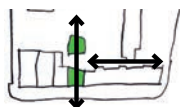
double exposition  
more light  
crossed ventilation



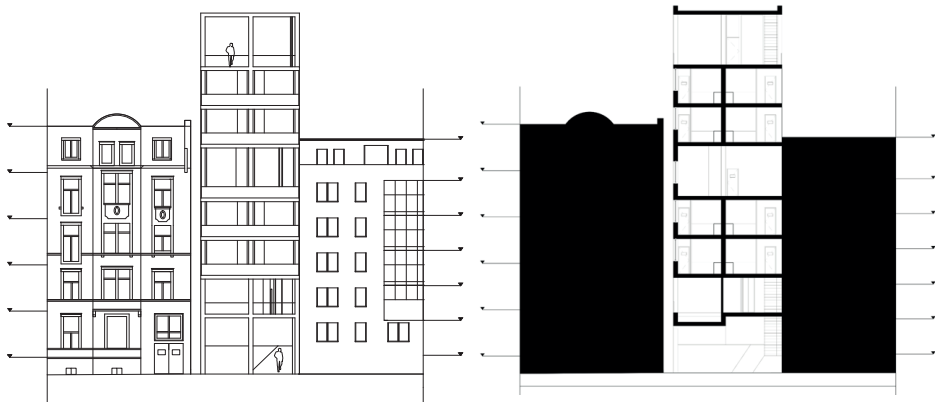
glass box  
more light to  
internal facades



PROTECTION  
FOR NOISE  
AND KEEPS  
THE WARM  
INSIDE



## design project 8

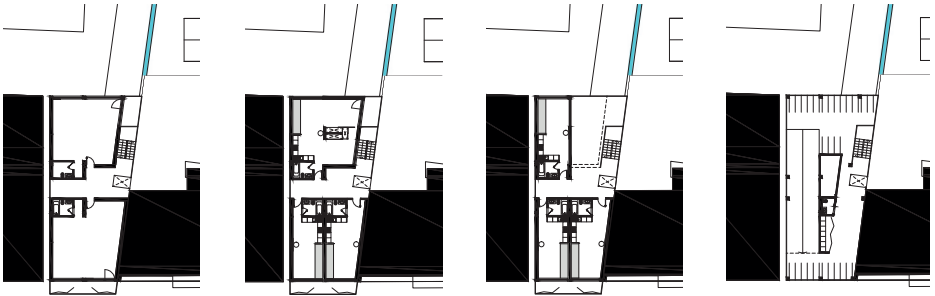


### group

Joao Pedro Francisco (pr)

Susana André (pr)

Nur Evitasari (id)





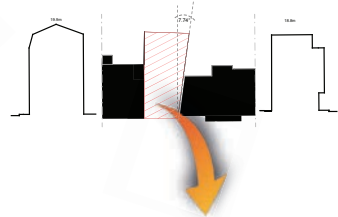
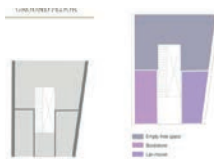


Photo: Christoph Dörner

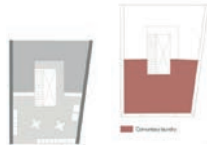
	Potential	Problems
Nearby places	<ul style="list-style-type: none"> <li>-Central European Bank</li> <li>-Restaurant</li> <li>-Nursery</li> <li>-Schools</li> <li>-Frankfurt School of Finance &amp; Management</li> <li>-Volkshochschule Frankfurt am Main</li> <li>-Bethmannschule</li> <li>-Stiftung Dr.Hoch Konservatorium</li> <li>-Paul – Arnsberg – Platz</li> <li>-Hotels</li> <li>-Shoppings</li> <li>-near the river</li> </ul>	<ul style="list-style-type: none"> <li>-Disorganization green space</li> <li>-Main Street has character of passage. There is no suggestion stop.</li> <li>-Problem scale (there's no transition between tower and houses scale).</li> </ul>
Population	<ul style="list-style-type: none"> <li>-Different age</li> <li>-Different ethnicities</li> </ul>	<ul style="list-style-type: none"> <li>-Much housing for a few people</li> <li>-Few people in large spaces</li> </ul>
Accessibility	<ul style="list-style-type: none"> <li>-Proximity to stations S-Bahn and U-Bahn</li> <li>-Bicycle path</li> <li>-Good accessibility for disabled</li> </ul>	
Weather	<ul style="list-style-type: none"> <li>-Good sun exposure</li> </ul>	<ul style="list-style-type: none"> <li>-Lack of shade</li> </ul>
Natural and physical support	<ul style="list-style-type: none"> <li>-Good amplitude</li> <li>-Clearly boundary between the pedestrian, road and bicycles crossings.</li> </ul>	<ul style="list-style-type: none"> <li>-Lack of covered areas</li> <li>-Little green spaces</li> <li>-Lack of benches</li> </ul>
Activities	<ul style="list-style-type: none"> <li>-Restaurants</li> <li>-Nursery</li> <li>-Hotels</li> <li>-Shopping</li> </ul>	<ul style="list-style-type: none"> <li>-Lack of spaces that promote socialization</li> </ul>



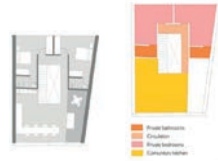
## design project 9



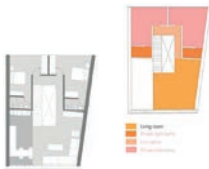
ground floor



first floor



second floor



third floor



fourth floor



fifth floor

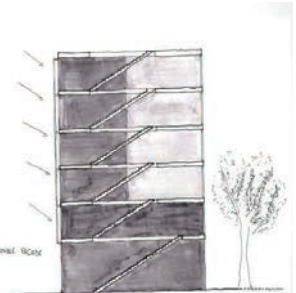
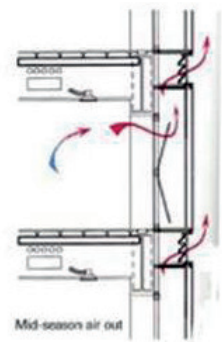
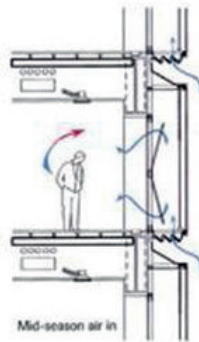
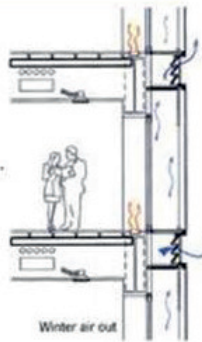
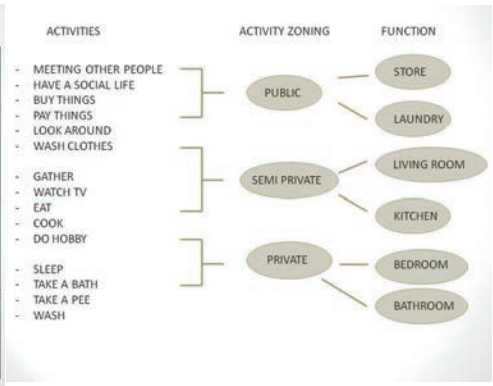
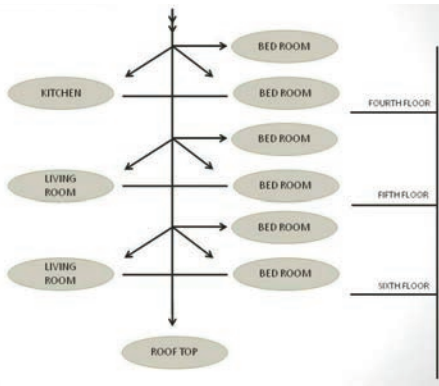


## group

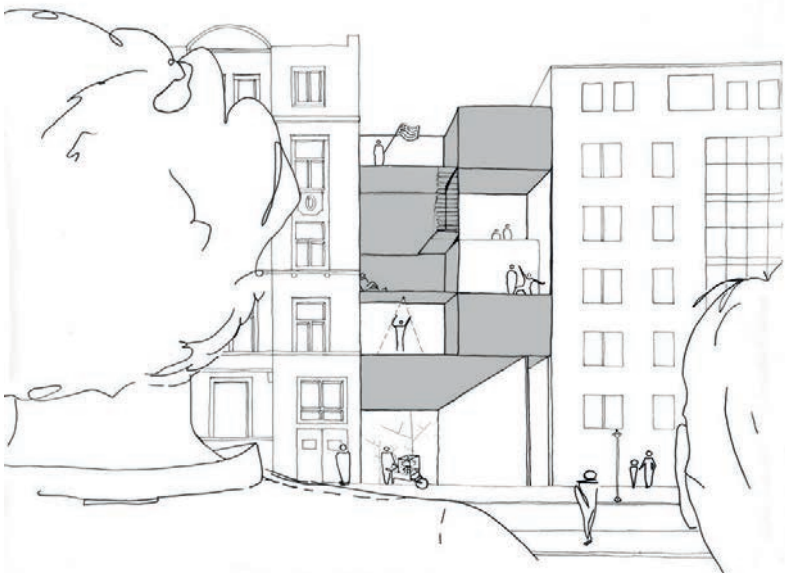
Alifa Imama Syahnovy (id)

Laura Costa Sousa (br)

Julia Godinho Vaz (br)



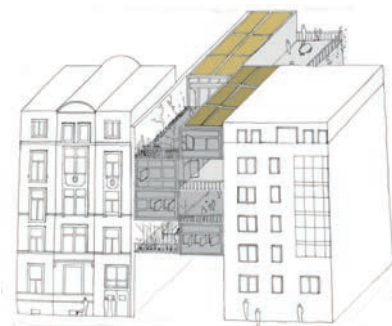
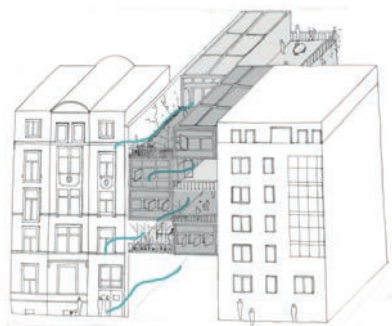
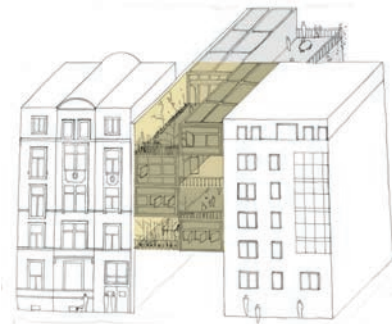
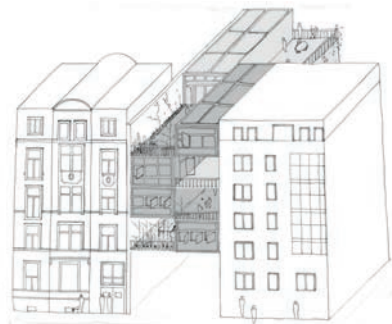
## design project 10

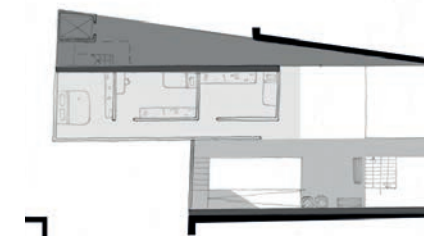
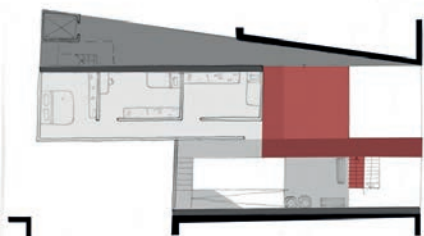
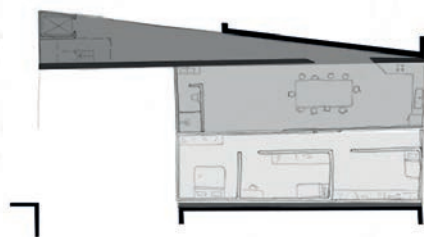
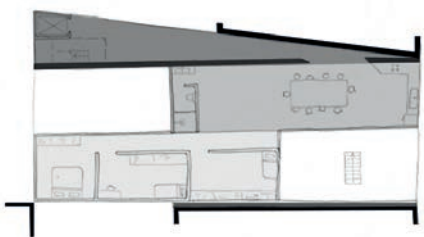
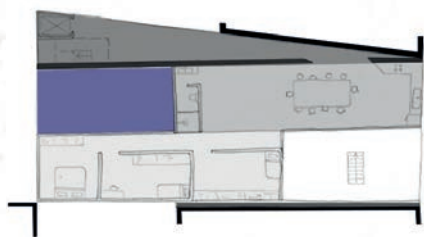
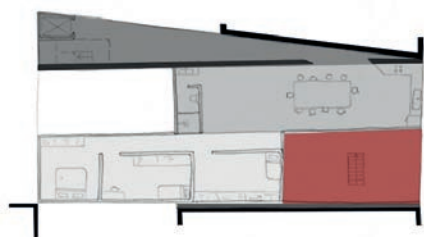


### group

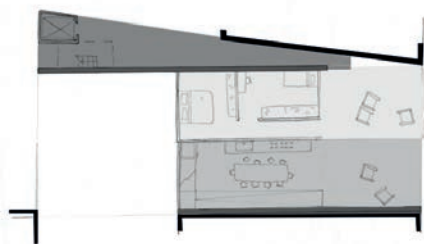
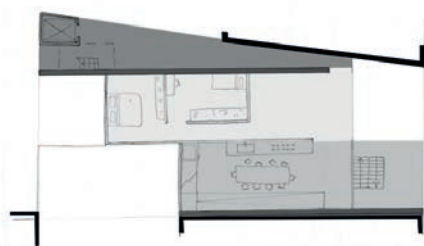
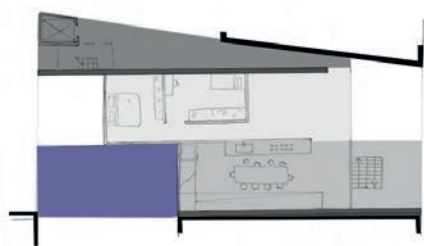
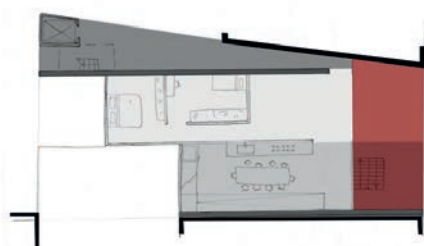
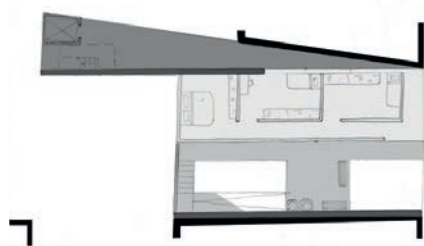
Laura Bellotti (br)

Yasmin Amalina (id)









## design project 11



ground floor



second floor



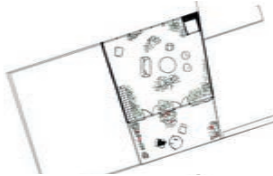
third floor



fourth floor



fifth floor



winter garden



## group

Leticia Encinas (br)

Gabriela Atanasova (de)

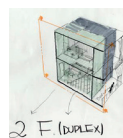
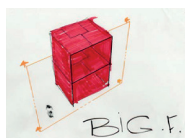
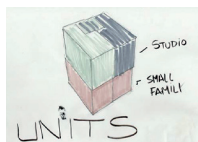
Camille Madinier (fr)



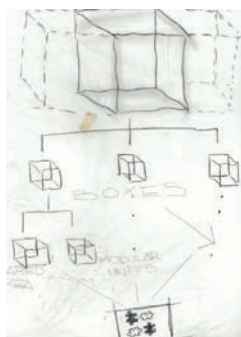
Bed and furniture  
for the Studio



DIFFERENT ASSEMBLY



## MODULARITY AND FLEXIBILITY

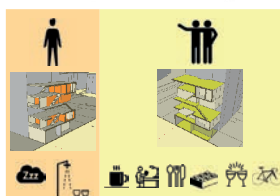
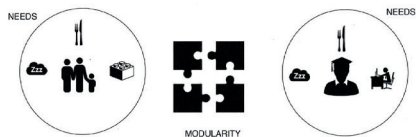


RENT-A-BIKE



### Concept

## SHARING THE SPACE



design project 12

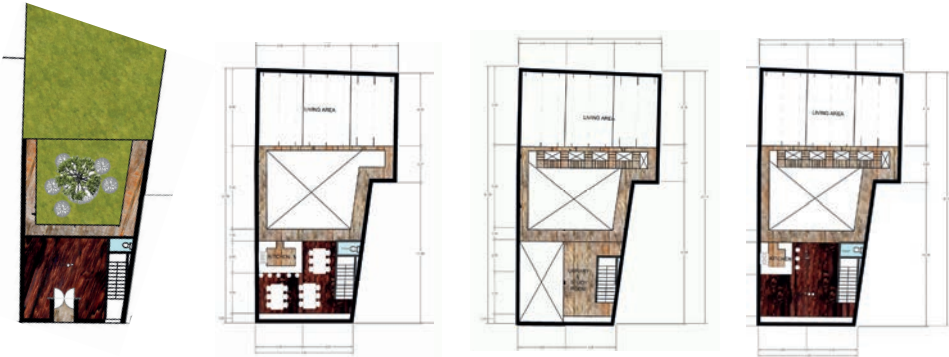


south elevation

north elevation

section

section



ground floor

first floor

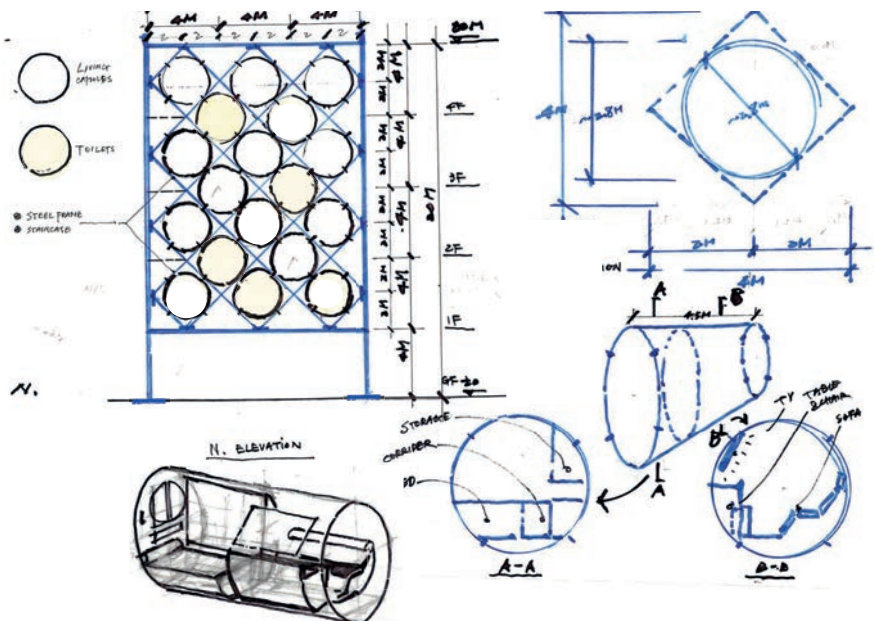
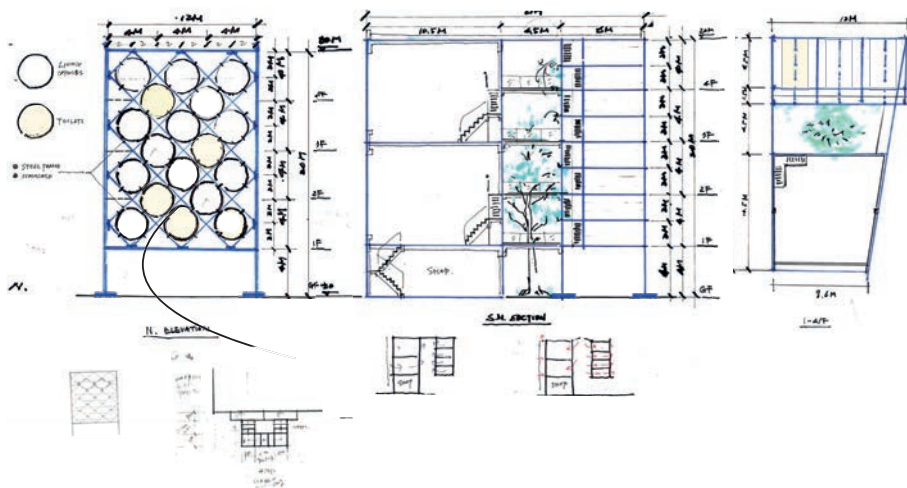
second and fourth floor

third floor

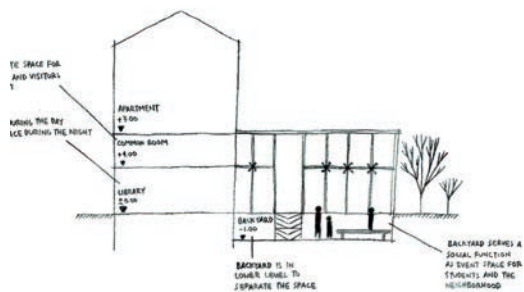
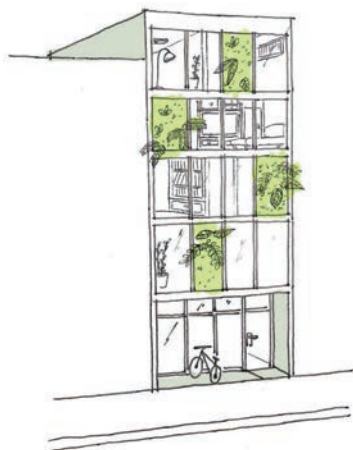


group

- Juliana Katayama (br)
- Mindy Zhang (chn)
- Anak Agung Tirta (id)



## design project 13



### group

Giovanni Frazzatto (br)

Amalda Hutasuht (id)

Pedro Gaspar (pr)

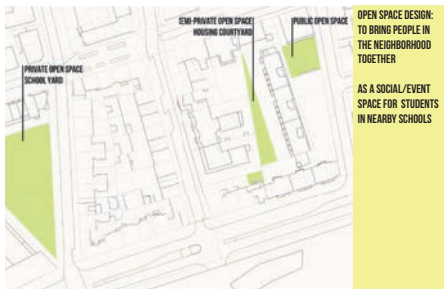




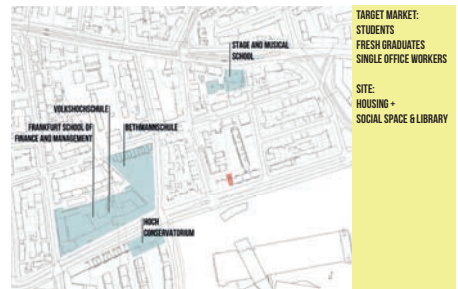
site analysis  
climatic conditions



site analysis  
land use



urban design concept  
open space design



urban design concept



site analysis  
building form and massing



urban design concept  
zoning





## imprint



TECHNISCHE  
UNIVERSITÄT  
DARMSTADT

TECHNISCHE UNIVERSITÄT DARMSTADT

Department of Architektur

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Organisation:

Fachgebiet ee / enb 2015

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Steffen Wurzbacher,

Christian Herbrik, Verena Kreß, Lazar Tsankov