

# Energy

## Investigating the Metabolism of Cities

---

prof. Jacques Herzog  
prof. Pierre de Meuron  
Charlotte von Moos  
Shadi Rahbaran  
Martino Tattara

students HS2012:  
Tom Doan  
Hannes Gutberlet  
Hubert Holewik  
Elena Sevinc  
Fromut Freya Winkelmann



<b>1. Introduction to the research</b>	9
Introduction	11
Six locationS	16
Six urban typologies in Basel	21
Six urban patterns	22
Spatial qualities	24
Six urban typologies	26
Urban models, references and chronology	28
<b>2. Six Urban Typologies. Assessing energy performances</b>	31
Six urban typologies in Basel: overview	32
Six urban typologies in Basel: references	36
Density of populations	48
Density of users	50
Energy consumption	53
Building envelope	59
Embodied energy per surface	63
Embodied energy efficiency	65
Shadow	67
Potential for renewable solar energy	71
<b>3. Six Urban Typologies. Proposals towards a energy reduction</b>	75
Schiffände. Historical Compact City	76
Gundeldingen. The Urban Block (1860's)	142
Genossenschaft 'im Langen Loh'. Row Houses (20's/30's)	170
de Bary. Modern Housing Development (1960's)	210
Reinach. Single Family House Suburbia	272
Erlenmatt. Contemporary Large Scale Block (2000's)	206
<b>4. Metropolitan analysis. Guidelines for a energy strategic project in Basel</b>	335
Introduction	336
Historical development	340
Topography	344
Built space	348
Unbuilt space	350
Transportation network	352
Public transportation and density	354
Vehicular traffic and density	356
Population growth	358
Traveltime distance	360
Superimposition	362
Mapping components	364
Conclusion	366



# 1. Introduction to the research



## INTRODUCTION

Contemporary discussion on energy and architecture is largely dictated by the condition of scarcity. We often hear that our city and our buildings are responsible for the consumption of large portion of energy. Due to this condition, in the last years we have witnessed a rising amount of technological innovations and advancements in terms of building materials and technology that would allow for large reduction of buildings energy consumptions and, in certain cases, even for energy production (many have i.e. installed solar panels on the roof of their homes as a way to contribute to the production of renewable energy). Yet, if we look especially at what today is generically called 'green architecture', it seems these technical advancements have most of the time not represented an improvement in the quality of the architecture of our city or of our buildings. Rather, many times such innovative projects have generally represented an impasse against the transformation of a certain status quo on the way we inhabit cities. It seems we have applied new technologies to be able to live the same way we got used to, we have placed solar panels on our roofs to be able to consume the same growing amount of energy we are used to, we have find ways to save on the energy necessary to heat our homes to keep up with the heating standards our society got accustomed to. It seems that the recent focus on technological innovations and on the shift from fossil fuels to renewable energy possibly mask an attempt to limit architecture from advancing solutions that would radically question the city's energetic dependence. As Ivan Illich pointed out in his essay 'Energy and Equity' a certain technology is always associated to a certain set of values and cultural patterns that become quickly dominant in every society which applies that technology. In the field of energy, the deployment of new technology, although important in itself, do

not represent a change in consumption habits but rather the attempt to make up with growing consumption rates even when the most dangerous and polluting source will be finally banned.

Large availability of cheap energy especially in the second half of the twentieth century, together with a certain belief in the process of modernization, have triggered a radical transformation of our daily life and imposed on us conditions of living we can now very difficultly separate from. In buildings, the results of this is clearly represented by the diffusion of a generic modern architecture where i.e. the traditional climatic intelligence and spatial responsiveness to local "energetic" conditions, that traditionally were always at the origin of typological development, have been overthrown by an undifferentiated, homogeneous and "artificial" space often insensible of those climatic concerns architecture have always tried to intelligently respond to. The current response to the energy problems of architecture (and of its associated energy bill) seems today to be largely based on strategies on how to obtain and maintain those living and spatial standard at a cheaper price (and eventually in a sustainable way) rather than fundamentally questioning whether those standards and way of life make any sense for our contemporary society. Differently, the current research on energy and architecture (and on energy and the city) is largely dictated by a technical/quantitative approach, aiming on the one hand at defining levels of consumption (see i.e. the recent MIT researchers map on energy use and building material intensity across US cities) and on the other at finding ways to reduce current building energy needs and increase energy production through renewable sources. These researches that are certainly important need yet to be correctly framed and placed within their respective field of competence. The large focus on energy production through renewable sources within the field of architecture represent a shift of attention from issues related to the way energy is consumed to purely quantitative concerns, thus reducing architectural research to the deployment of a given technology.

Studio Basel investigation into the relationship between architecture and energy will on the contrary attempt to reclaim discipline's instrumentality towards the project of the city and its architecture. The research will assess the meaning of this relationship in order to build up proposals that will reformulate spatial configuration, urban densities and typologies that would allow an innovative understanding of our relationship with energy. Rather than equipping architecture with the latest technology, the research will start by understanding the past and how energy has been central in the development of architecture and the city, in order to project the future. Focusing on the relationship between form and energy, between urban space



and energetic process will be the prerequisite for interventions that would perhaps more fundamentally challenge the current society energy addiction in a disciplinary meaningful way.

### **An introduction to the research**

Contemporary discussion on energy and architecture is largely dictated by the condition of scarcity. We often hear that our city and our buildings are responsible for the consumption of large amount of energy. Due to this condition, in the last years we have witnessed a rising amount of technological innovations and advancements in terms of building materials and technology that has allowed for large reduction of buildings energy consumptions and, in certain cases, even for energy production (many have i.e. installed solar panels on the roof of their homes as a way to contribute to the production of renewable energy).

Yet, if we look especially at what today is generically called 'green architecture', it seems these technical advancements have most of the time not represented an improvement in the quality of the architecture of our city or of our buildings. Rather, many times such innovative projects have generally represented an impasse against the transformation of a certain way we inhabit cities. It seems we have applied new technologies to be able to live the same way we got used to, we have placed solar panels on our roofs to be able to consume the same growing amount of energy we are used to, we have find ways to save on the energy necessary to heat our homes to keep up with the heating standards our society got accustomed to. It seems that the recent focus on technological innovations and on the shift from fossil fuels to renewable energy possibly mask an attempt to limit architecture from advancing solutions that would radically question the city's energetic dependence. As Ivan Illich pointed out in his essay 'Energy and Equity' a certain technology is always associated to a certain set of values and cultural patterns that become quickly dominant in every society which applies that technology. In the field of energy, the deployment of new technology, although important in itself, does not represent a change in consumption habits but rather the attempt to make up with growing consumption rates even when the most dangerous and polluting source will be finally banned.

Large availability of cheap energy especially in the second half of the twentieth century, together with a certain belief in the process of modernization, have triggered a radical transformation of our daily life and imposed on us conditions of living we can now very difficultly separate from. In buildings, the results of this is clearly represented by the diffusion of a generic modern architecture where i.e. the

traditional climatic intelligence and spatial responsiveness to local “energetic” conditions, that traditionally were always at the origin of typological development, have been overthrown by an undifferentiated, homogeneous and “artificial” space often insensible of those climatic concerns architecture have always tried to intelligently respond to. The current response to the energy problems of architecture (and of its associated energy bill) seems today to be largely based on strategies on how to obtain and maintain those living and spatial standard at a cheaper price (and eventually in a sustainable way) rather than fundamentally questioning whether those standards and way of life make any sense for our contemporary society.

Differently, the current research on energy and architecture (and on energy and the city) is largely dictated by a technical/quantitative approach, aiming on the one hand at defining levels of consumption (see i.e. the recent MIT researchers map on energy use and building material intensity across US cities) and on the other at finding ways to reduce current building energy needs and increase energy production through renewable sources. These researches that are certainly important need yet to be correctly framed and placed within their respective field of competence. The large focus on energy production through renewable sources within the field of architecture represents a shift of attention from issues related to the way energy is consumed to purely quantitative concerns, thus reducing architectural research to the deployment of a given technology.

Studio Basel research into the relationship between architecture and energy will on the contrary attempt to reclaim discipline’s instrumentality towards the project of the city and its architecture. The research will assess the meaning of this relationship in order to build up proposals that will reformulate spatial configurations, urban densities and typologies that would allow an innovative understanding of our relationship with energy. Rather than equipping architecture with the latest technology, the research will start by understanding the past and how energy has been central in the development of architecture and the city, in order to project the future. Focusing on the relationship between form and energy, between urban space and energetic process will be the prerequisite for interventions that would perhaps more fundamentally challenge the current society energy addiction in a disciplinary meaningful way.

The research that is presented in the following pages has been based on a series of premises and assumptions.

### **A limit to energy consumption**

Limiting energy use and consumption is not simply a technical project. On the contrary, a project that limits our addiction to energy needs to invest the way we live in our cities and the subject that inhabits our cities. In this sense, architecture and urbanism should not simply rely on available technology but foresee spatial configurations and forms of densities that are able to propose a new way we inhabit urban spaces and therefore forge a new urban subject.

### **Basel as representative of the European mid-size city**

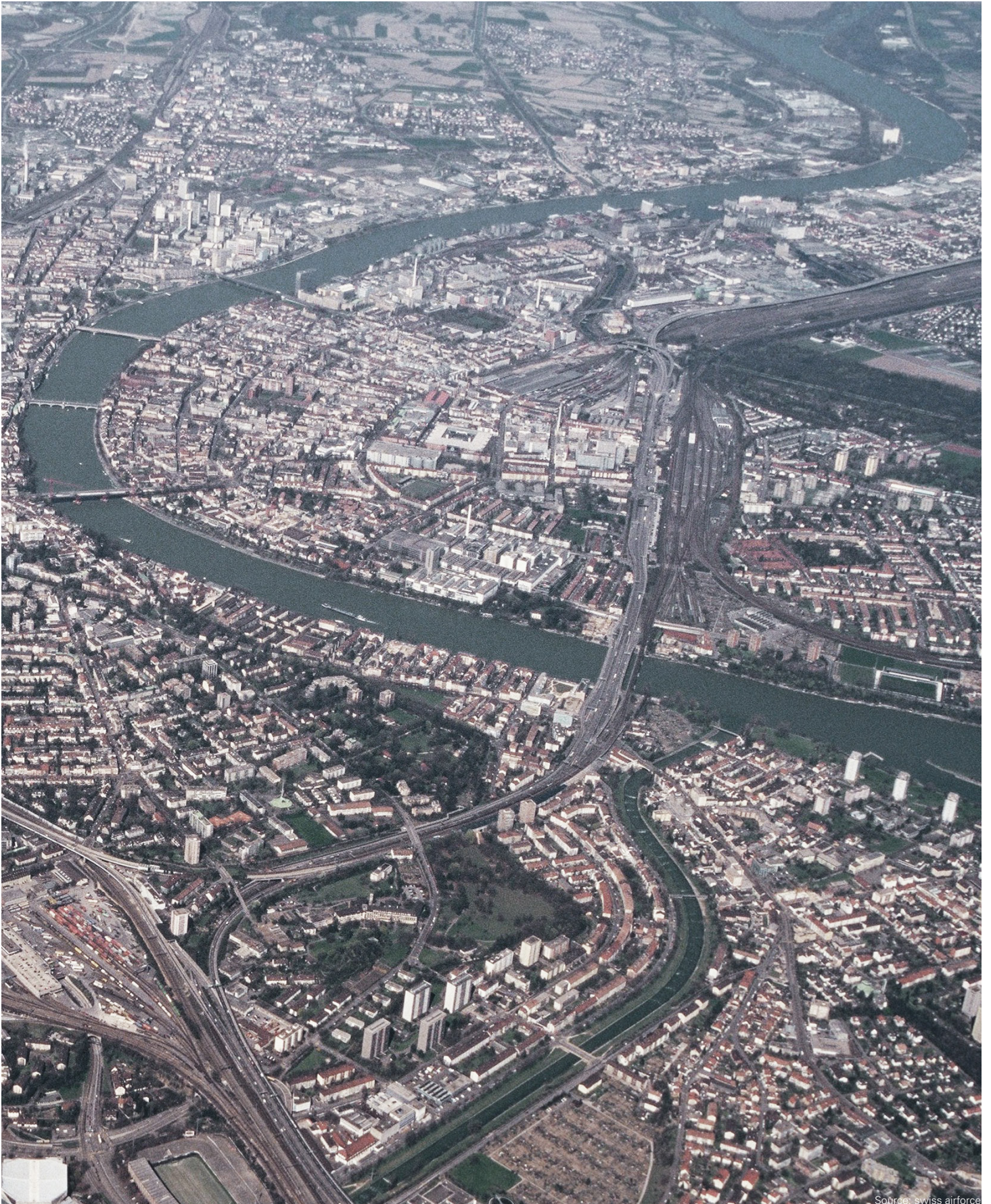
Although the perception of the European mid size city is often based on the celebrated profusion of public spaces, on the uniqueness of civic buildings, on social density, and on historically layered urban structure, this research introduces an alternative understanding of this urban category, one based on the repetition, accumulation, and variation of a limited vocabulary of urban typologies. In this sense, this research by focusing on six relevant urban typologies in Basel (the

dense historic compact city, the perimeter blocks of the 18th century, the row housing of the beginning of the 20th century, the modern housing interventions, the contemporary urban sprawl and the free-standing large blocks of the recent years and the mixed typology – to which we could possibly add the industrial sites that characterize the periphery of our cities) try to address the mid-size European city as a common category by focusing on one specific case – Basel in Switzerland. Although the proposals and ideas here presented are specific for the city, the set of problems and solutions that are here presented are intended to advance ideas that could be applicable to other cities.

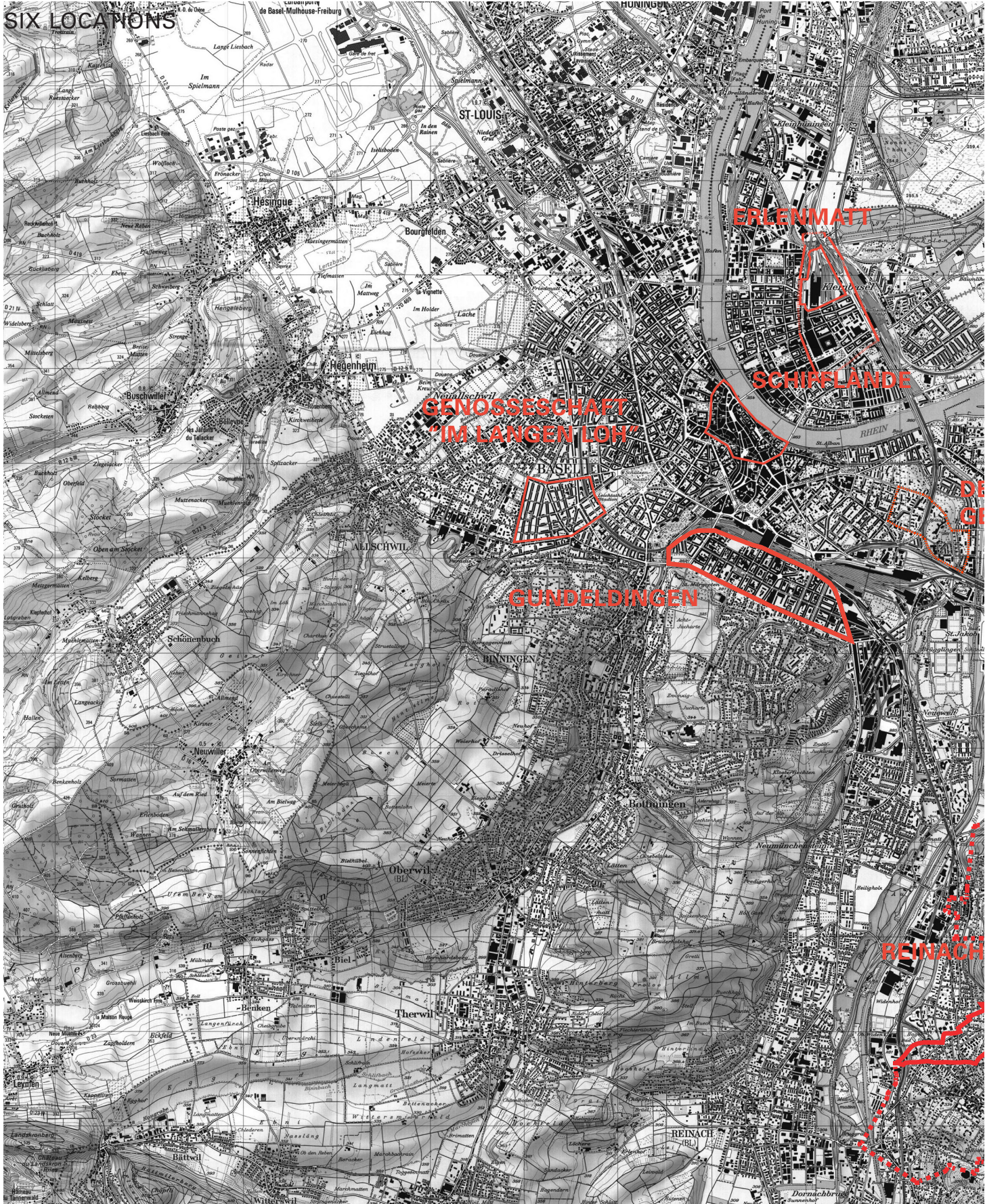
### **Urban typologies and embodied energy**

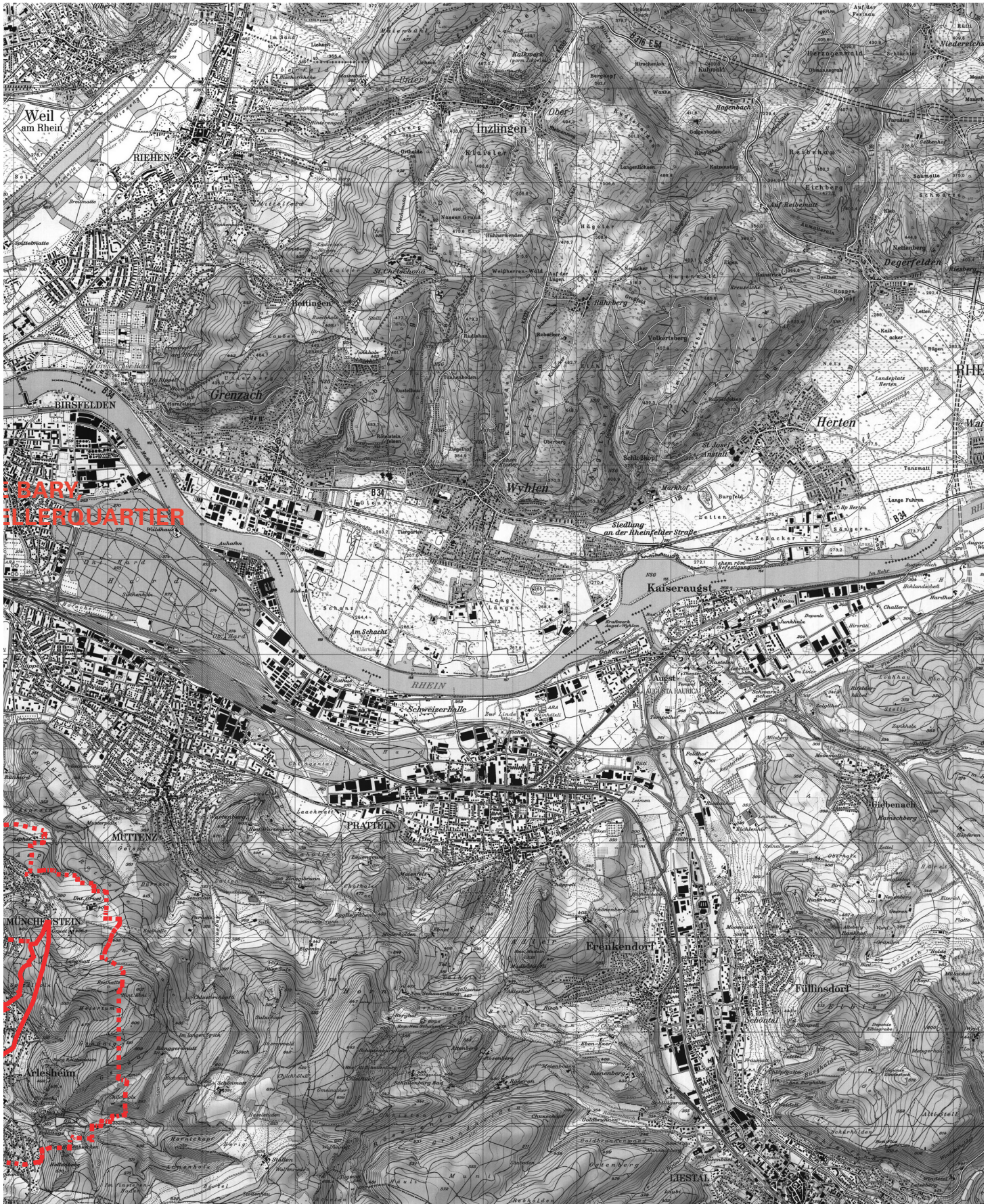
The following research and proposals are based on the idea that a city where energy use would be limited needs to be transformed in several ways. A series of factors become important in such project: transportation and mobility patterns, the transit time between home and work, the densities of facilities and inhabitants, the proximity of inhabitants to collective facilities, the availability of natural resources etc. Although these issues can be addressed in terms of new development and new constructions within the city (like the construction of new centralities), an important aspect has also to be taken into account: the embodied energy. Next to energy consumption, assessing the performances of a city it becomes crucial to consider the values and significance of the embodied energy, or in other words the entire energy that has been used in order to build a certain part of the city, considering the energy used for the production and delivery of building materials, for the constructions of a building, for its demolition and the energy needed to run such a building. On the base of such considerations, it becomes clear that it is especially those parts that we might not like that necessitate a process of transformation rather than a process of demolition and eventual reconstruction. For this reason, in the following pages the focus is on the possibility of transforming the existing rather than imagining the new.





SIX LOCATIONS







HISTORICAL CORE



PERIMETER BLOCK



ROW HOUSES



HIGHRISE



# SIX URBAN TYPOLOGIES IN BASEL



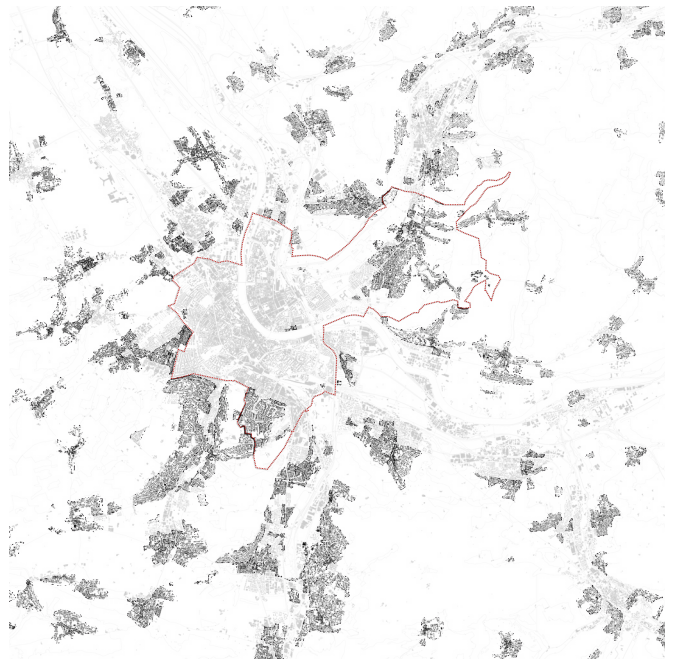
MIXED TYPOLOGY



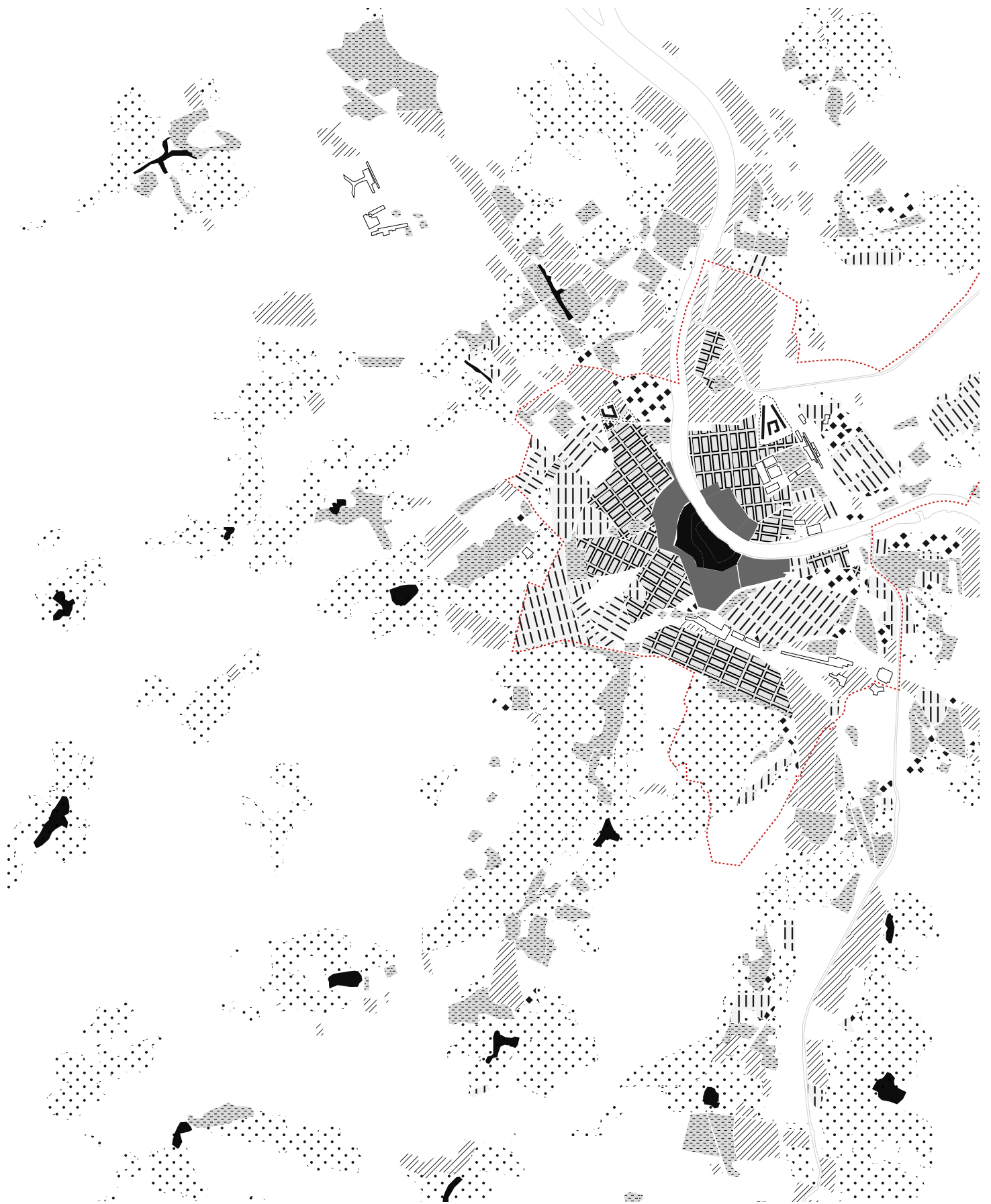
INDUSTRIAL AREA



LARGE FREE STANDING

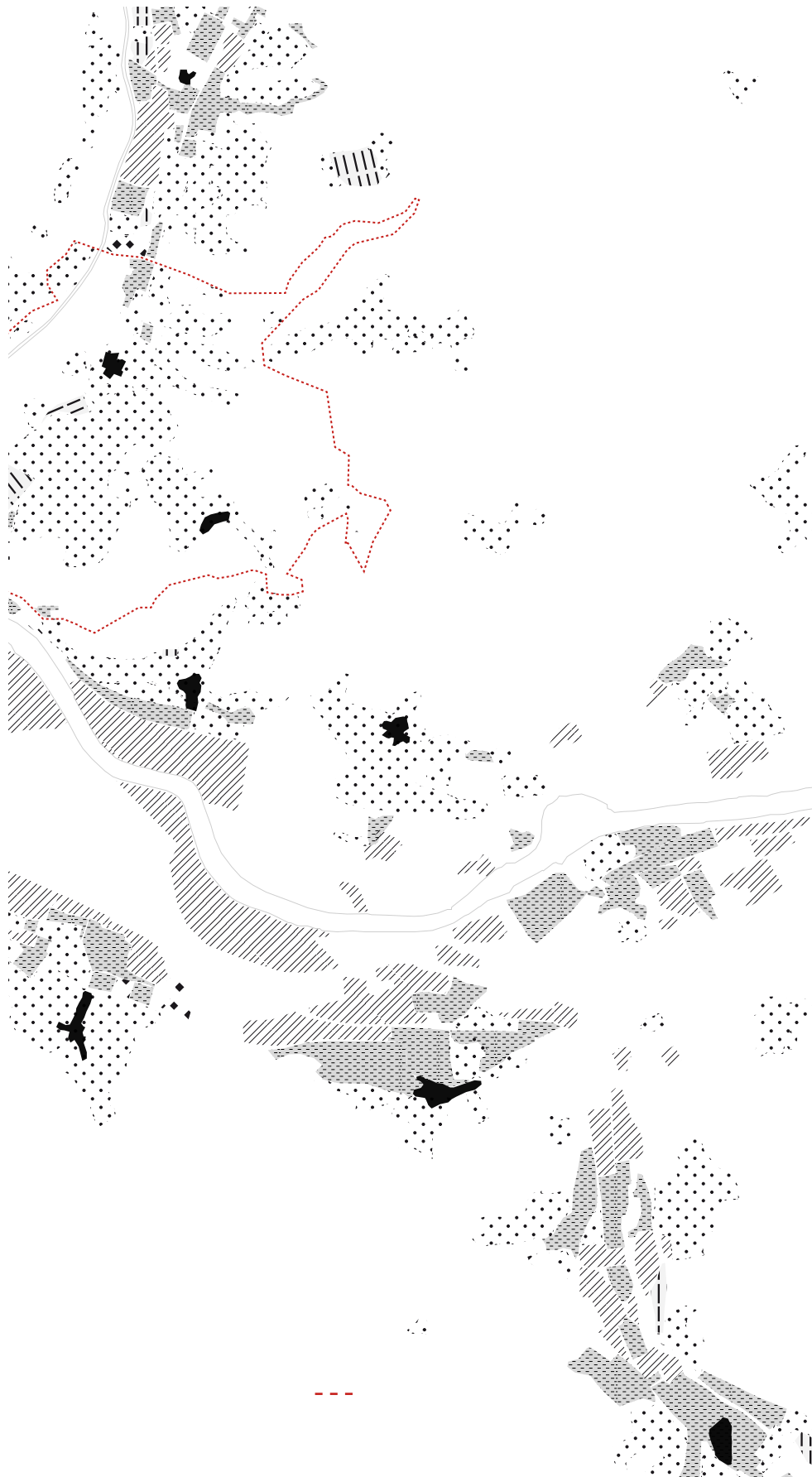


SMALL FREE STANDING



## SIX URBAN PATTERNS

In order to define MetroBasel's built pattern from a typological perspective we have identified and mapped eight distinguishable urban types which can be found in the entire Basel metropolitan area. This map is then used further for investigations concerning connectivity and future development potential. Each type is defined by a certain density, spatial structure and quality.



- historical core
- perimeter block
- row houses
- high-rise
- mixed typology
- industrial area
- large free standing
- small free standing
- Basel-Stadt



Historical compact city



Perimeter block



Row houses



Modern housing development

# SPATIAL QUALITIES



Mixed Typology



Industrial Area



Large free standing block



Freestanding single family house

## SIX URBAN TYPOLOGIES



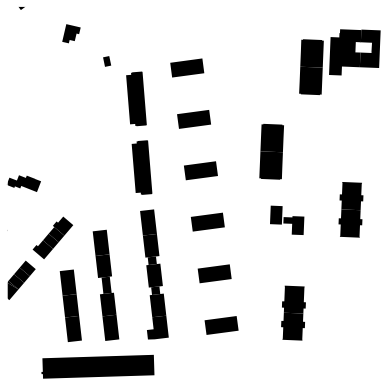
SCHIFFFLÄNDE, BASEL  
Historical Compact City  
Figure-ground plan, 1: 6000



GUNDELDINGEN, BASEL  
The Urban Block (1860's)  
Figure-ground plan, 1: 6000



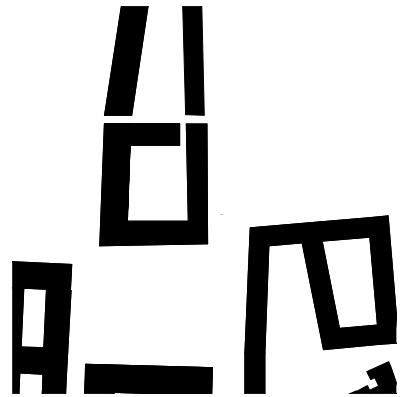
GENOSSENSCHAFT 'IM LANGEN LOH',  
BASEL  
Row Houses (20's/30's)  
Figure-ground plan, 1: 6000



DE BARY, BASEL  
Modern Housing Development (1960's)  
Figure-ground plan, 1: 6000

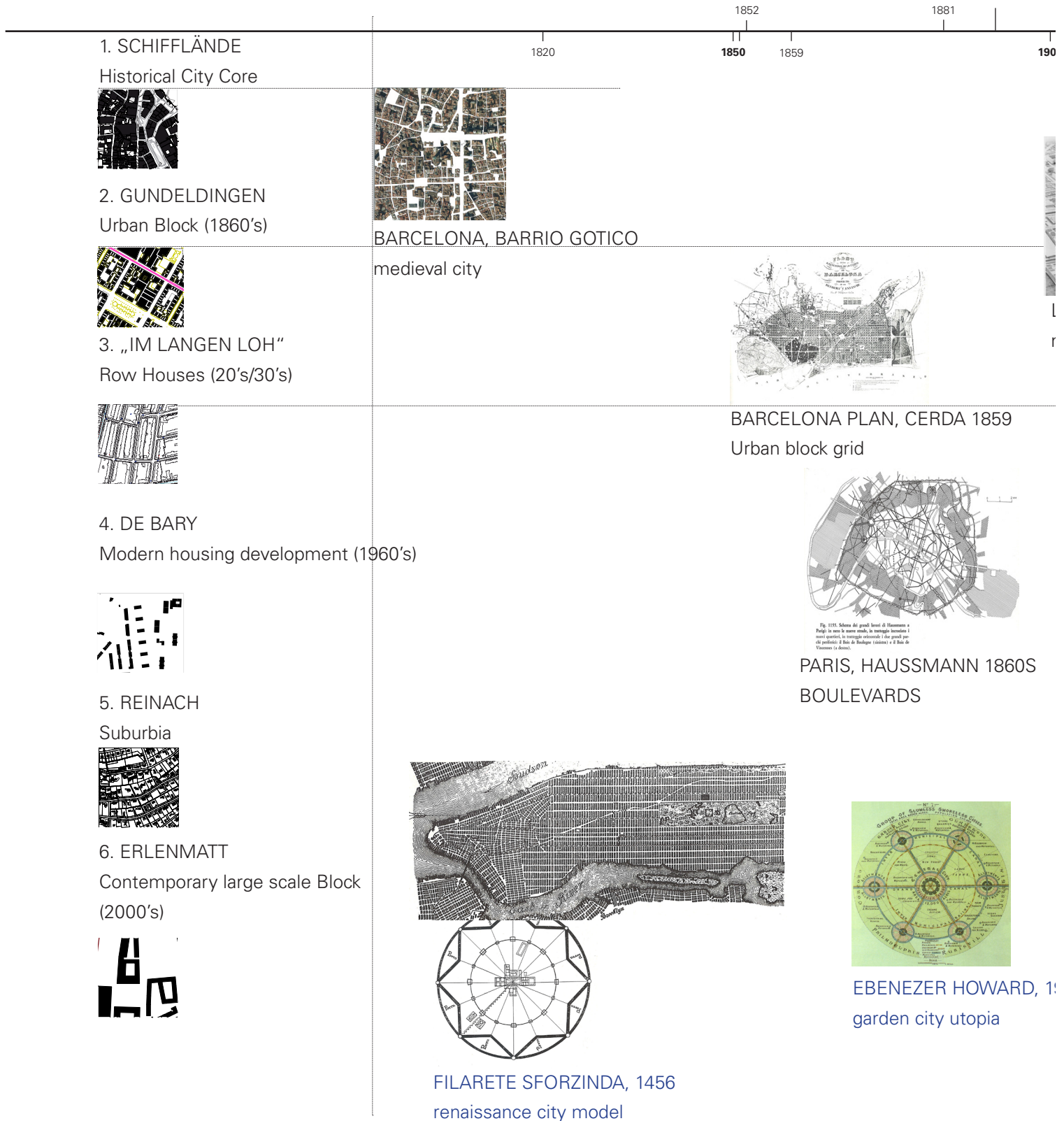


REINACH, BASEL  
Single Family House Suburbia  
Figure-ground plan, 1: 6000



ERLENMATT, BASEL  
Contemporary Large Scale Block  
Figure-ground plan, 1: 6000

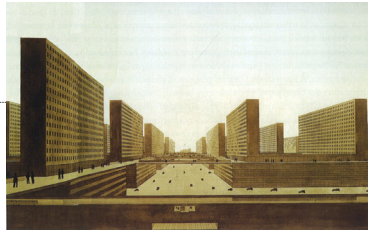
# URBAN MODELS, REFERENCES AND CHRONOLOGY







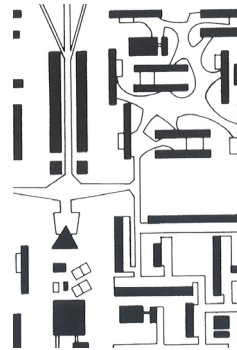
LE CORBUSIER, PLAN VOISIN, 1925  
modernist city



BERLIN, HILBERSHEIMER, 1928  
modern block



AMSTERDAM, BERLAGE 1927  
row houses



BRASILIA, LUCIO COSTA 1960  
modernist city



FLW BROADACRE CITY, 1935  
suburban utopia

902

CAMILLO SITTE 1889  
City planning according to artistic principles

ALDO ROSSI 1966  
l'architettura della città