ABSTRACT

Designing for a sustainable future has always been one of the driving forces of building. There was never a building built with the idea that it was not to last. When we talk about sustainable design nowadays we consider evaluating first of all the impact of global warming and the limited resources available, based on the categories of the Brundtland Report.

Based on the 4th assessment report of the IPCC, the French meteorologist Stéphane Hallegatte studied the climate profile of 12 European cities today and in 2070. As a result he was able to point out, that for instance the situation of Berlin, Germany will change to a situation similar to Rome today. In other words looking for building strategies for Berlin today could be approached by looking at the make of the city fabric of Mediterranean cities today in respect of energy efficiency and water conservation.

Based on the results of the last summer academy on architecture, reurbanization and sustainability ars09berlin we started a field study comparing the city fabric and the building typology based on the study of Stéphane Hallegatte. I consider the interims results of the field study a valid base to discuss architecture strategies tackling future energy standards and water conservation issues.

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I | Preface

Ever since the oil crisis in the 70ies, saving energy became worldwide a national target to provide sufficient resources to allow for a reasonable security of energy supplies. With the Climate Change Convention of the Earth Summit in 92 in Rio and the subsequent following of the Kyoto Protocol in 97, most of the world leading countries agreed to legally binding reductions in greenhouse gas emissions of an average of 6 to 8% below 1990 levels between the years 2008-2012. The from the European Commission issued Action Plan for energy efficiency leading to a number of consecutive directives to be implemented on a national level. The focus of these directives had been improving energy efficiency with the goal of reducing the use of fossil, non renewable, resources followed by the reduction of greenhouse gases. With the communication "Energy efficiency for the 2020 goal" of the European commission from Nov. 2008 the first time climate change turns into an addressed issue.

2 | Adaptation

The 4th assessment report of the IPCC, marked a turning point in public perception of global warming. With the reception of the report the general public no further debated the fact, that we do face climate change, the question discussed, was what could be done and what is the anthropogenic factor. Preparing the UN Climate Change conference in Copenhagen in December in L’Aquila (Italy) one of the issues discussed, is to anchor the 2-degree goal in an UN context, in order to derive to emission cuts accordingly. Hans Joachim Schellnhuber, Director of the Potsdam Institute for Climate Impact Research (PIK), introduced the term “tipping element” to describe large-scale components of the Earth system that may be pushed past critical thresholds by anthropogenic forcing. Exceeding the 2-degree critical global mean warming is considered such a tipping element. The result would be an abruptions change, rather than a continues smooth development of global warming. While the US was debating the anthropogenic cause of the global mean warming and therefore even academic institutions explored precautions to be taken addressing rising water tables, in Europe architects and planners focused on mitigation. Students at the Pratt Institute New York ended up developing schemes entering New York downtown highrise buildings by boat. At the international summer academy arsberlin we explored architectural strategies to build for Berlin 2050. On the grounds of a study of the PIK for the Federal State of Brandenburg we looked at ways, to create an understanding for the conditions to be expected. The study did focusing on agricultural issues addressing wood fires and a lower ground water table, still gave insights in the development of the climate around Berlin. Comparing the climate profile of Berlin at present with the data of the study for 2050, it became obvious that the building would have fit for northern Italy, let’s say Milano. The French meteorologist Stéphane Hallegatte, along with Sebastian Kopf and Minh Ha-Duong, published a study in 2007 (Using maps of city analogues to display und interpret climate change scenarios and their uncertainty), introducing an approach to understand the consequences of global warming, rather than looking at figures, debating as to weather we will have to face an increase of 1° or 4° mean annual temperature. They developed a model comparing the climate of twelve European cities, with twelve cities which already will have approximately the expected climate situation simulated today. The outcome of the study was based on the A2 greenhouse gas emission scenario of the IPCC 4th assessment report; (A world of independently operating, self-reliant nations. Continuously increasing population. Regionally oriented economic development. Slower and more fragmented technological changes and improvements to per capita income.) The simulation is run using two different models, HadRM3H Model of the Hadley Center and the ARPEGE-Climate Model from CNRM/Météo-France, applying three indicators to characterize climate conditions: Aridity Index, Heating Degree Days and Cooling Degree Days. Considering regulations, codes and directives addressing climate issues up to recently, global warming played only a small roll if at all. Concepts of mitigation dealt with stable climate conditions and focused on the reduction of fossil energy consumption. Various energy standards for buildings discussed presently, do not consider the eventuality of future cooling loads of the building and still achieving similar energetic standards. In reference to the outcome of the study of Stéphane Hallegatte we did explore analogue methods approaching urban design and the design of buildings.

3 | Method

Following the analogue approach of Hallegatte, designing a city to fit future conditions, would also recommend to explore available conditions and experiences of today’s cities. Depending on the simulation model chosen, in the best case the climate of Berlin will be by the end of this century comparable to Campobasso, southeast of Rome (Italy) or worse like Chlef (Algeria). The mean high temperature in summer at present in Berlin is around 23,1°C compared to temperatures in Campobasso 26,1°C and Chlef 37,3°C. The different results represent the uncertainty due to different presumptions taken into account of the simulation models. Stéphane Hallegatte further outlined the economical impact, which has to be dealt with depending on the precautions taking into account at present. Considering the uncertainty involved his study shows that preparing for the best case scenario proves the best results, still leaving the possibility to act when it becomes obvious that the latter scenario will take its course.
Looking at these results from a planning perspective the strategic conclusion is to deal with these results as scenarios, meaning that they are considered parameters of one likely future. Therefore planning for this future also means to be prepared for these uncertainties.

4 | Urban planning

Planning contextual is a common and recognized approach in today’s architectural practice. Analyzing the parameters of the site and cross-referencing the program is the professional approach preparing design decisions. With the impact of global warming many of the traditional architectural patterns have to be questioned. Instead of following engineered recipes, which at best will be able to address the impact of design decisions in respect to a future warmer climate, the looking at cities which already deal with those climate conditions for a long time, will offer a wide range of references. Complexity and continuity can best be observed and transferred exploring existing conditions.

Transferring the local traditions of warmer climates to a northern region seems to be reasonable. Still on an empirical level there is the question how to evaluate method and approach. What are the forces shaping an urban settlement in the first? The following paragraphs are the attempt to pin point some of the morphological characteristics relevant to an analogue approach.

5 | Hellenic and Roman Empire

Cities today in general can be traced back to a number of different patterns. Hellenic and Roman traditions were founding patterns and are still recognizable in many urban fabrics. It would be short fetched to assume that the urban fabric of those days is still at work. In general the street pattern is visible but the typology of buildings has changed from 1 or 2 story houses to multistory buildings. Hippodamos, a Greek planner of the 5th century B.C. masterminding the settlements of Olynth, Priene, Milet, Alexandria and others did consider the possibility of maximizing solar gains throughout the winter period and proposing overhangs which would work as sun protection in the summer months. The main streets, East West, were build between 5 to 10 m wide and the sides between 3 to 5 m with buildings 1 to 2 stories high. (Leonardo Benevolo, Die Geschichte der Stadt, P. 143)

The Roman castrum based alike on a grid pattern was equally spread to most parts governed by the Roman Empire. Nero’s rebuilding of the destroyed Rome in 64 AC went along with applying building regulations, wider streets and a limited building height. Tacitus commented, that some felt the former fabric of the settlement healthier and more comfortable due to the narrower allies and higher buildings providing shade and protecting from the sun. Surprisingly enough building heights under Augustus were limited to 21 m, which allowed for insulae with 6 to 7 stories; Trajan later lowered the maximum height to 18 m. Hygenus a roman planer proposed the ideal castrum with a footprint of 720m x 480 m. The area was fortified before the buildings were erected. The urban pattern was created by blocks with a footprint by 75 x 75 m. Pompeii shows an extension developed along the principals of Hippodamus. The size of the urban block was either 95 m or 116 m long and 34 m wide. In case the lots have been square one side was 61 m long. Looking at today’s cities this system can be detected very often; Milano, Bologna, Turin, Verona, Aosta, Rimini, Florenz, Trier, Nimes, Vienna, Lyon, Cologne, Cadiz and Paris to name some of them.

6 | Medieval City

With the decline of the Roman Empire this urban tradition started to be transformed and adapted to the social and economic changes. The refiguring of the socioeconomic network ended with its own interpretation of space and form, the medieval city. The urban settlement meant protection, was a place for trade and last not least the domain of the church. The foundation of a medieval city was pre-conditioned by either a castle, or clerical engagement like a monastery or the bishop’s residence.

Unlike the Roman castrum the medieval city did not follow preconditioned formal ideas. Medieval settlements were in general laid out in an oval or egg shaped manner, following the topographical conditions or build around the premises of a fortress, unless their origin went back to roman times. In those cases the rectilinear shape prevailed. The form of the fortification was established after the city was developed, which explains the various amorphous shapes of medieval cities.

Due to the increase of the power of the guilds, the merchants and nobility it was less likely for the authority to lay out the urban plan as it was done in the Hellenic and Roman period. It was a period in history when ordinary people began to take an acknowledged place in society. Throughout the medieval period the authority therefore was less inclined to use their power to order the relocation of land in order to build a city as shown on an ideal map. “Medieval surveyors commissioned to lay out new planned areas within existing towns faced a number of problems. The most difficult to solve was the fusing of the new area onto the old with the minimum of separation from, and disruption to, that older area. The provision of a plan which demanded a breakthrough street into the existing development presupposed an overarching authority which was not usually extant in the medieval (English) town. … all medieval plans therefore have both an “ideal” projection, which can usually be conceived
as some geometrical figure, and which existed only in the mind of the surveyor, to both the natural topography and to any existing features of the rural and suburban landscape. ” T.R. Slater, The Build Form of Western Cities, Leicester 1990, P. 68
The pattern of the medieval urban settlement was to provide protection and allowing for trade. The idea to set up a city followed the idea to connect important points comfortably, which could be direct or following a topographic logic. Social status and economic interest formed the neighborhoods and quarters of trades and professions. Hygienic and fire protection issues regulated how close building were to be build. Lewis Mumford points out in his book “The City in History” that naturally the inhabitant of a medieval city was looking for protection for the winter storms and therefore would carefully avoid to build funneling street lay outs. Particularly because of the layout of the medieval city was it possible to follow the day to day routines in the open. Freestanding buildings, so Mumford, were the exception, which he explains with the extra effort necessary to heat the building.
Likewise in the southern region the narrow streets and overhangs protected the pedestrian from rain and sun. He further addresses that variation in height, building material and roof slopes, as well as the typography of windows and doors contributed to the local tint.
Advanced technology led to changes in the building typology. Enhancing the thermal comfort in prestigious palazzos for the summer month led in Florence and Genoa to buildings with higher ceilings and galleries. The flipside was getting those rooms heated was equally difficult to be heated. The development of the open hall connecting the upper floor with a gallery and lit by a skylight was equally difficult to be heated and offered only a comfortable situation only in the summer months.

7 | Islamic City

Along with the decline of the Roman Empire, the influence of the Islamic culture transformed the shape of the city. The order no longer was following the rational principals of the castrum. The order of the Islamic settlement was generated by building clusters in relationship to families or clans. The function of the public space was limited to religious regulations to separation. The only two public domains were the public bath and the mosque. Both being accessible to everybody, were located at strategic spots within the maze of narrow streets. The palace of the emperor was located in the vicinity sheltered from his people. As a consequence the orderly arranged setup of the Hellenic or Roman settlements were transformed into an irregular cluster of one story houses, oriented towards an atrium, anonymous to the street.
The reign of the Arabs encompassed at some point almost all of Spain and the south of Italy. Therefore the cities of Cordoba, Seville, Toledo but also Palermo still show the traces of that time. The urban fabric of Venice still shows the influence. The order of the city is hardly to be captured on a glance. Lots of public buildings are located at smaller streets or canals not easy to be reached and therefore save.

8 | Renaissance, Baroque

The development of ideal city took place at a time of little growth of the population. The need for city extensions was not a given. Building those cities led to moderate density and does not challenge the balance of economic and hygiene criteria. Similar to the lay out of the roman castrum the plan allowed for further development. The Friedrichstrasse in Berlin, part of the so called baroque city extension in 1674 aligned with two story high buildings. First with the development of the industrial revolution building at Friedrichstrasse reached the height of 22 m, regulated by the land development plan of 1862.

9 | Tradition and Transformation

The transformation of the urban make of the Roman castrum shows which building typology was able to deliver the best possible result under the given circumstances. Looking at the development in Germany for instance the city of Regensburg and comparing it with the cities of Turin, Como or Pavia, gives an idea what the benefit of an analogue approach to the development of the fabric of the city could be.

In Regensburg alike those other cities mentioned in Italy the pattern of the Roman castrum is still evident. While in Regensburg the city block developed with buildings around the perimeter with additional towards the back; one will find an equally dense development of the inner area of the block in Italy.

Planned city extensions at the end of the medieval period, and at the rise of the industrial period show a similar regional interpretation of strategies to develop the urban fabric. In both cases the overall ideal plan of the city was part of the intellectual discourse but not the objective when developing the details of the plan, local conditions, social, economic and climatic issues controlled the outcome. When pointing at climatic, conditions those were summarized under hygienic issues, so to speak along the least common denominator rather the best practice example. History shows that whenever there was a problem jeopardizing the quality of life within the city to a considerable extend regulations were put into place to adjust.

In Berlin 1862 a land development plan was introduced by James Hobrecht a young engineer to facilitate the rapid growth of the city. The necessity of the land development plan was explained by the need to access the building lots in case of fire. For this purpose among others, building lines were established along with a minimum width of streets depending on the intended height if
the buildings. For 4 to 5 story high buildings a minimum width of than 60 feet (ca. 22 m) was considered appropriate. Regulations about the kind of buildings which were to be build were in the land development plan not addressed. The size of a courtyard was determined by the building code, large enough to turn the fire engine around. Those regulations determined within a fraction of a century the typical Berlin urban fabric. Building height of 22 m and streets with about the same width. Property is still one of the limiting factors in executing an urban plan developed on the boards. Looking at the planned city we find what at a given time also was considered best practice. In 1550 in Galeazzo Alessi an Italian architect designed in Genoa the Strada Nuova along with various palazzos. The street 250 long and 7,5 meters wide catered to the nobility. The project is considered one of the first examples of an urban development projects in Europe with a unitary framework, where the site was specially parceled by the authority along with a particular system of ‘public lodging’. Interesting is the combination of the palazzo with such a narrow street which obviously was designed to create a comfortable public space and also provide shade to the neighbor building. The idea to have free standing buildings makes a lot more sense in a southern climate.

10 | Conclusions

Looking at the urban fabric of Mediterranean cities a number of strategies are at hand. Similar to the idea to look at a city of today which will have a climate condition developing due to global warming by the end of this century it makes sense to look at the urban fabric in its complexity by exploring a particular situation.

Klaus Theo Brenner a Berlin architect outlined in a study, comparing the city fabric of Genoa with the one in Berlin, the numerous possibilities of a morphological interpreting the urban block. The relationship between the street, the building and the yard defines the public and the private space. Still there is more to this than an academic exercise. The development of the city block in Berlin addresses much more the cold winter by houses build wall to wall forming a continuous street, while the buildings in Genoa (We addresses the development of the nuova strada) free standing, offer a larger surface to work better in the summer. But not only the typology of the houses is different, the width of the streets being much narrower requests also a further differentiation between streets to fit the through traffic, the smaller street to access the quarter and the pedestrian ally. The question at stake is the quality of the space between the buildings, considering global warming.