subjecting them to the actual climatic conditions of the Negev.

By using this unconventional research tool, we have identified patterns in the design-climate relationship that are of practical use to urban designers. Stated in the form of a very general recommendation, it could be argued that neighborhood-scale planning should strive to create a 'selective' urban fabric — recognizing that the value of a 'compact' street geometry depends, for example, on the axis orientation of the street in question. When walking along a street that runs north-south, a pedestrian is likely to benefit from higher walls and closer spacing during most hours of a hot summer day, because the effect of deep shading is so dominant in the overall energy balance. As the direction of the street changes, though, the balance between the direct and indirect effects of the sun, along with effectiveness of ventilation due to changing wind patterns, is altered as well — so that for an east-west oriented street axis, the advantage of compactness becomes negligible. In fact, there is good reason to widen the spacing between buildings on the opposite sides of such a street, because — as in Neve-Zin — it can facilitate solar access to their south-facing windows, and thereby contribute to energy-efficiency on an urban scale.

Obviously there is much more to successful and humane urban design in the desert than these simple relationships. The influences of vegetation, building materials, and heat-generating activities in a dense urban setting, and peoples' subjective perceptions of comfort and their related patterns of behavior are but a few aspects of the larger question. But the use of systematic methods can, and is continuing to, contribute to our understanding the basic realities of the desert climate — knowledge which, when applied together with wisdom, can benefit future desert dwellers and builders.

Apology for Architecture, or the Planner's Craft

Isaac Meir

Instead of an introduction

'Architect' is a strange and misinterpreted term. Coming from the Greek '*arkhitekton*,' meaning master builder, it implies a broad background of knowledge in town and site planning, building design, structures and construction, materials and techniques, systems and details, and not least, the arts — sculpture and painting, frescos and stained glass. Such were the great masters that designed the buildings and monuments we all like to visit and study. Architecture may thus be defined not as a discipline but as an umbrella for, or a conglomerate of related disciplines. Architecture has been defined therefore as 'mother of all arts,' yet to Arnold Toynbee is often attributed the infamous quotation "but what can one say about the mother when the daughters work the streets?"

In past ages it was mostly religious, institutional, and monumental buildings that were designed by architects, whereas the vast majority of shelters, or homes of the average individual, were built by artisans and the end-users themselves. Since the 18th and 19th centuries, however, architecture has evolved into an academic profession, which eventually has led to an unfortunate disconnection between the architect and the other building related professionals, not least through an over-indulgence of architects in matters of 'higher order' philosophical questions, matters of style and aesthetics (Salingaros *et al,* 2004). It is quite often that students of architecture, and even qualified professionals, may have a broad knowledge of the most recent stylistic discourse between deconstruction and late post-modernism, yet may have little to say about energy in buildings, the urban heat island, or physical planning and how it affects public health.

This general academic, bourgeois discourse usually leaves out marginal populations and regions, among them deserts. In the latter resources are limited, constraints are extreme, indigenous populations usually are poor, and shelter has a very flexible yet basic meaning. It may well be that living in a desert — something I have done for the past 20-odd years — has sharpened my perception of and pointed my antennae to all of these problems. It may also be that city living blunts certain instincts, whereas life in the desert returns us to our right place in relation to nature, natural forces, and our ability to affect our environment (usually adversely) and suffer from the boomerang effect this has on our lives and those of our children.

The next few pages have no pretence of being an academic paper, but are rather a personal communiqué of what I perceive as the real priorities of my profession. This is what I have been asked by the editors to do.

Challenges

Design and construction in the near future will be challenged by the following three decisive processes: accelerated urbanization in developing countries; the progressive depletion of fossil fuels and other natural resources; and the impact of human activities on the environment.

These topics have not yet attracted the attention they deserve in the architectural discourse, though they are critical to our future. The lack of interest of architects in these issues is the origin of the title of this article; a sort of paraphrase of Marc Bloch's book, *"Apology for History or the Historian's Craft."* The demographic trends of the last decades predict that by the year 2030, about half of the world's population will live in the cities of the developing countries (INFO, 2006). These processes are not controlled and certainly are not planned. Their significance is in the addition of large numbers of people to cities whose existing services and infrastructure are already collapsing under current pressure. The residential zones springing up around the big cities are usually slums without infrastructure for water and electricity supply, and without orderly sewage systems. Surveys show that

only about 40% of the urban population in Africa have access to running water (and sometimes even that is limited to a single water tap in the center of a neighborhood), and that less than 20% are hooked up to any type of sewage system. The percentages in Asia and South America are higher than in Africa, though not nearly as high as in the industrialized countries (UNESCO, 2003).

In addition to the health implications of these two topics, there exists the problem of construction from nonstandard materials (corrugated sheet metal, industrial waste, cardboard, polyethylene sheets, etc.) that cannot provide adequate living conditions or thermal comfort. The tenants of these substandard structures also suffer from fuel poverty. Weak populations in the industrialized countries also suffer from this phenomenon, though for different reasons: while fuel is widely available in developed countries, disadvantaged populations simply cannot afford to pay for it. When standard sources of fuel are unavailable, people tend to use whatever they can find for cooking and heating, including animal dung and waste materials (Sauerhaft, Berliner, & Thurow 1998). Combustion of these materials is a health hazard, especially when they are burned in a closed space (Smith, 2003).

Architecture of minimalism: cow dung as fuel, India (left); and as a building material in a Maasai manyata in Maasailand, Kenya (right).

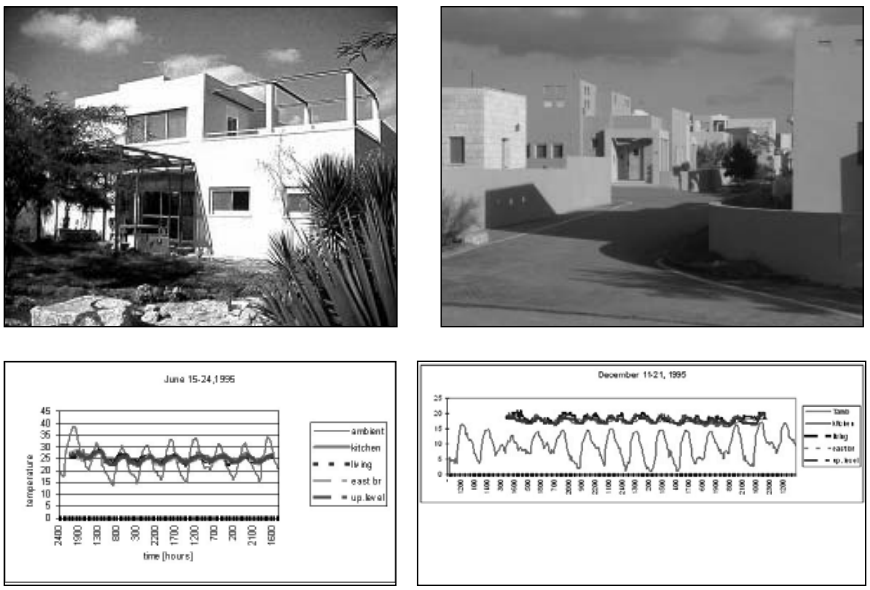
People of the wealthy world are, ostensibly, spared these problems since they have access to available, relatively inexpensive forms of energy. Today, about half of the energy consumed in industrialized countries is invested in buildings primarily for heating, cooling, lighting, movement, but also in the production of the materials, and the construction and demolition of the buildings. Mechanical systems such as air-conditioning have enabled the development of unique building types that rely on high energy input for their normal operation, as opposed to the traditional, vernacular, and historic precedents.

The vernacular as a paradigm: traditional mud house in the Atacama desert, Chile (left); and a contemporary bioclimatic experimental adobe house in the Negev desert, Israel (design by Desert Architecture & Urban Planning and Applied Solar Calculations, Blaustein Institutes for Desert Research, BGU).

On buildings and fossil fuels

An example of modern buildings are multi-story ones that are dependent on mechanical user transportation systems (i.e., elevators, escalators, etc.) and on pumps to raise water to high levels (including fire extinguishing systems). Other examples of modern building systems are deep-plan office buildings that require artificial lighting, ventilation, and air conditioning due to the distance of the main part of the space from the facade; and buildings with shells of glass and steel or lightweight materials that lack insulation and/or thermal mass to store energy and are thus unable to regulate their inner climates without air conditioning systems. It has become more and more apparent that the sustainability of such structures over time is doubtful, since the energy sources on which these buildings rely, are being depleted at a worrisome rate. Both researchers and petroleum companies estimate that the turning point will take place between 2010 and 2020 when the extraction of petroleum will reach its peak rate and go into decline, although demand may continue to increase (Bartsch & Mueler, 2000). These estimates are based on consumption trends and present development, but already energy demand is growing exponentially in relation to the potential supply. The economy of China (estimated to grow by over 9% in 2006) and other fast-developing countries is based on the growing exploitation of dwindling sources of energy. The present rate of energy consumption cannot continue indefinitely, and this threatens the future of the building types most common in our modern cities - or more correctly, the survival of their tenants.

The prevalent building and construction styles in the world's largest cities, especially in the city centers, create knotty environmental problems. One of the most tangible environmental problems is the urban heat island. This refers to the phenomenon of higher temperatures in a city, especially its core, compared to the



The individual building and the context in a desert case study (counterclocwise, from top left): the author's bioclimatic house (design by I.A. Meir); summer monitoring showing four locations within the house fluctuating at around 24-26 deg.C (daily ambient average) without air conditioning; winter monitoring showing four locations within the house fluctuating at 19-22 deg.C (well above the daily ambient maximum) without auxiliary heating; the solar neighborhood in which this house is built ensures solar and wind rights (masterplan by Desert Architecture & Urban Planning, Blaustein Institutes for Desert Research, BGU).

surrounding countryside, caused by the combination of deep urban canyons with hard surfaces, lack of shade, trapping of incoming solar radiation, and heat retention of the buildings and structures. This contributes to the consumption of more energy to air-condition the buildings found in these heat islands; and this, in turn, probably exacerbates the heat island phenomenon as well.

The world discourse regarding global warming is also related to our discussion here. The summer of 2003, one of the hottest in European history, inflicted many casualties. France alone recorded about 15,000 deaths above average for the season, and these were directly connected to nights in which the temperature did not dip below 29 degrees centigrade. We can assume that the air temperatures in the crowded city centers were even higher than this, and reached even higher levels inside the buildings — and this gives us a formula that links physical planning and morbidity/mortality. True, the polemics regarding anthropogenic contribution to climatic changes has not yet been resolved, but more and more evidence attests to our non-negligible influence (Schär *et al,* 2004).

On buildings and health

A fascinating discussion is taking place between the public health people and physicians on the one hand, and atmospheric scientists and city planners on the other. These latter professionals deal with the problematic relations between the built-up space in which we live and the by-products of the use of natural resources (including fuel). They study the effects of these factors on air quality both outside and inside buildings, and on our health. New studies, for example, point to a direct link between proximity of neighborhoods and educational institutions to main roads, and an increase in asthma outbreaks in children, and between proximity of residential areas to power plants and acute respiratory system problems among children (Dubnov *et al,* 2007); between sealed buildings with expensive, energy intensive air-conditioning, and the 'sick building syndrome'; between unwise land allocation for building, and severe problems such as flooding, subsidence of buildings, penetration of contaminants, and more. The flooding of New Orleans may be an extreme example of such improper land allocation, though it is definitely not the only one. Recent studies show areas potentially flooded under specific climate change scenarios, among them parts of the Netherlands and the United Kingdom, Bangladesh and areas around the Mekong river, to mention but a few.

Some of the world's environmental and climatic changes are connected to the desertification processes. In the last twenty years, deserts have expanded by about 50%, and today, drylands make up around 45% of the world's continents. Yet our view of desertification remains ambivalent. Arid, sparsely populated zones are perceived as useless (beyond the exploitation of their limited natural resources), or as venues for problematic activities such as nuclear experiments and the disposal of hazardous waste. On the other hand, we must remember that deserts are home to and affect, directly or indirectly, some two billion people. The desert's expansion brings many people to the frontier and others to the heart of the desert, and this creates migrations of refugees and economically-motivated immigrants.

Though we often have a hard time relating to such macro-scale events and chains of events, the following example may prove a good illustration of the immediate and intimate relations between the lifestyle of an individual and the global changes and effects. In the 1980s and 1990s a prolonged and extreme drought in the Sahel caused the death of 100,000-250,000 people, affected 20 countries and 150 million people, 30 million of whom were in urgent need of food aid, and created 10 million refugees seeking food and water. Originally the Sahel Catastrophe was attributed to ignorant and primitive pastoralists of the Sahel and the way they overexploited their environment by overgrazing, thus causing desertification and drought. However, a few years down the line a strange connection was identified between cooling of the seas around Europe and a change in the monsoon regime, weakening the rain-bringing winds, thus causing aridization of the Sahel.

The seawater's temperature reduction was eventually attributed to global dimming, which is caused by aerosols in the atmosphere (Giannini, Saravanan,&

Chang, 2003). The source of such airborne particles is coal-fed power plants, vehicles running on combustibles, and industrial plants. Whereas none of these sources was significantly present in the Sahel, all of them were in massive presence in Europe. Thus, what was originally thought to be the 'crime and punishment' of ignorant people and the way they took advantage of their environment, proved to be the unintentional influence of the affluent world on the poor and hungry African desert. And here is the right place to remind the reader that some 50% of all energy used in the industrialized countries is invested in buildings!

This might have been the end of the story, coupled with some aid and development programs intended to somehow improve the situation of the refugees and the host countries in the region, had it not been for an additional detail and twist of destiny usually disregarded. Some 50% of the global dust in the air today originates in arid Africa. This has been the impact of drying, causing the planet's atmospheric dust loading to increase by 33% (Flannery, 2005). This in turn has been shown to have a direct influence on morbidity and mortality, as demonstrated by a study connecting dust storms in the north-western Provinces of the People's Republic of China with mortality in Taiwan (Chen *et al,* 2004). Can this then prove to be a new nemesis for the industrialized, non-desert world?

These three trends or processes — urbanization, depletion of natural resources, and human effect on the environment — should be a focus of interest for all planners and architects. The real challenge for professionals and decision makers lies in understanding the phenomena, and responding with appropriate policies, in the following fields:

- Adaptation of design and construction to environmental constraints, particularly desert conditions, through the utilization of alternative energy sources and materials.
- Development of passive heating and cooling systems for buildings and semi-open spaces.
- Post Occupancy Evaluation (POE) of projects aimed at the creation of benchmarks for future planning and design.
- Study of the urban micro-climate and adaptation of settlement forms and patterns to the desert conditions.
- Water policy and resources management.
- Proactive contingency planning.
- Study of refugee-related problems such as food and water security.
- Study of historic settlement and building patterns and construction technology, allowing better understanding of low-tech construction upgrade for the future.

Instead of an epilogue

The major challenge of the coming years is to adapt buildings and settlements in general, and those in arid zones in particular – both in developing as well as developed countries – to the needs of the future. An interdisciplinary approach needs to be promoted as the essential basis for sustainable planning (Roaf, Chrichton, & Nicol, 2004). The abuse of the environment, desert and non-desert, cannot go on without heavy repercussions, and it is up to the planners and the architects to take a more active role in the decision-making processes (Meir, 2005). It is not a question of choice, but rather one of necessity — I might even say sheer survival, but that would be too dramatic coming from an architect.

Is this relevant to desert architecture? After all, that was what the editors asked me to write about. I am confident it is of relevance. Deserts, after all, are more extreme than their neighboring non-desert regions. Deserts are characterized by a wide diurnal and seasonal temperature fluctuation, the former reaching some 30°C in the Atacama Desert, the latter reaching some 90°C on the Iranian Plateau and in Mongolia. They are also very erratic in terms of precipitation, with rainfall being concentrated spatially and temporally in a small number of events, usually causing floods. Indigenous building materials are limited and demand special structural systems, details and maintenance to provide appropriate and safe shelter. Water availability puts constraints on water use in general, and in particular on the viability of conventional landscaping, often used as a microclimate modifier. Deserts cover large parts of the planet, practically in all continents. Vast numbers of people are affected by the deserts themselves and their expansion — desertification. All of these make the deserts more than legitimate study areas, and desert architecture more than relevant.

So the answer is positive — all this discussion is relevant to desert architecture. But more than this, it is of relevance to architecture at large — as a discipline, as a profession, as a main player in a game that affects the present and future of all of us. And it is an apology for the wrong turn architecture has taken in the last few decades, misleading the public in buying products that won't last, will malfunction and put the user in danger — products within which we spend some 90% of our lives.

Let's put architecture back to where it belongs, shall we? Let's rediscover the "mother of all arts," and restore a bit of her old dignity — and future relevance!

Notes

1. Based on a shorter version published in A Voice from the Desert, A Bulletin of the Jacob Blaustein Institutes for Desert Research, October 2005, pp. 6-7.
2. The author is architect, town planner and archaeologist, and current chair of the Department of Man in the Desert, BIDR – BGU.

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