The FuturArc Interview

Dr Wolfgang Kessling

Director, Transsolar Energietechnik GmbH

By Lakshmi Menon

Gaining from architectural practice in India, **Lakshmi Menon** moved to Singapore to further her interest in architectural research and writing. Her travels across the sub-continent have helped her gain first-hand experience of environment-sensitive lifestyles prevalent in developing nations. She probes into sustainable building practices as an outcome of these socio-economic and cultural preferences rooted in the Asian context. Recently graduated with a Master's degree in Integrated Sustainable Design from the National University of Singapore, she looks forward to examining the myriad dimensions of sustainability with renewed perspectives.

Dr Wolfgang Kessling is one of the directors of Transsolar Energietechnik GmbH, Munich—an international climate-engineering firm that approaches sustainability through innovative climate and energy concepts for buildings. Founded in 1992, Transsolar has about 50 engineers with offices in Stuttgart, Munich, New York and Paris. The practice focuses on enhancing human comfort with minimum resource use.

Dr Kessling has been instrumental in spearheading the energy concepts of prominent projects such as the Cooled Conservatories at Gardens by the Bay, Singapore; Zero Energy Office Building, Kuala Lumpur, Malaysia; and the Human Resources Headquarters at Novartis Basel, Switzerland. In the interview with Lakshmi Menon, he shares his critique on system-centric building design practices of today, at the wake of an impending energy crisis.

LM: From physics to climate engineering, can you briefly chart your trajectory of practice?
WK: I studied nuclear physics until Chernobyl, the nuclear catastrophe that happened in Ukraine. In April 1986, I changed from nuclear physics to solar physics. This made me relook at energy sources and understanding the potential that solar energy holds. Thereafter, I worked as a researcher for 10 years, investigating and developing solar air-conditioning systems. In due course, I understood that it was quite important to make buildings better before employing systems to make them comfortable. Better-designed buildings decrease the need to rely on energy sources.

This ideology brought me to Transsolar, which was founded at that time by friends of mine. Most of them came from similar research backgrounds. Our worldviews suggested that we rethink our buildings before we negotiate with the energy systems that enhance them. In this manner, if one can reduce the demand for energy, the debate on renewable versus non-renewable sources becomes meaningful. This is where we are at in Transsolar. We essentially strive to make buildings comfortable from an energy standpoint.

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LM: You are a physicist. Does not being from an architectural or engineering background impact the way you think about buildings?
WK: So in our attempt to make building designs better, we focus on the fundamentals of physics. It's not so much about applying rules of thumb, codes of practice, etc., which everyone is trained to do. For us, everything to do with the building distils down to the thermodynamics of its constituents. We closely study the performance of materials and how their attributes impact the performance of the building in totality. I could say that my scientific background helps me think about performance.

I cannot draw too well nor am I a good designer—but I monitor the performance of the building that is linked to design decisions. For example, how does glass as a material used as a design strategy for shading perform in different climatic contexts? This is what makes climate engineering powerful—we fundamentally study the performance of materials. We look at buildings and system performances, microscopically yet holistically. It does sound complex and difficult but here lies the opportunity to innovate and improvise market norms.

LM: Then how do you get across to people about the importance of your work, given the complexity?
WK: The answer to this is two-fold. Today, we convince our clients, architects and other practitioners best by built examples. It's easier to showcase quality intended for a new project, by letting stakeholders experience them first-hand in our completed projects. But it wasn't like that earlier—people could not understand what climate engineers like us were up to. But as years passed, and our projects got built, our roles in the design process became more clearly defined. The projects become the realisation of an integrated design process that we believe is the crux of all the work we do.

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Photo by Adriá Goula Sardà

1 Site organisation of classrooms at Lycée Français Charles de Gaulle in Damascus, Architects Atelier Lyon

2 & 3 Site model of BRAC University Dhaka, Bangladesh **4** Rendering of the new campus building of the BRAC University Dhaka, Bangladesh **5** Atrium of the new campus building of the BRAC University Dhaka, Bangladesh

LM: Why is the integrated design process important and what role do you play in it?
WK: The integrated design process is an iterative, cyclical practice wherein we revisit the design decisions taken earlier. The need and importance of a design attribute should be questioned based on the criteria that were initially set. How relevant are the criteria? Does the design meet the performance requirements? Does the design perform satisfactorily? If not, what can be done? These are important questions to ask in the integrated design process.

I understand my role to be that of a facilitator—to combine the architectural vision with systems and material properties. Our mindset is directed towards sustainability; in creating environments that are comfortable but low in energy consumption. This gets tricky when more people get on board the design team. Then challenges arise in communicating one's priority over the other. Communicating and keeping ideas alive along the design process until it becomes reality is one of the most important aspects of my job.

LM: A lot of what you say speaks to quality of comfort within buildings and outdoors. Why comfort?
WK: It's true. I am very interested in designing for comfort, keeping the users in mind. I can listen to people talk about how beautiful the architecture is etc., but what I essentially root for in my projects is comfort. Comfort can be defined in technical jargon. But that apart, comfort to me is when you sense it and don't speak of it. For example, if you are in a comfortable space in a building and you realise that you don't need better alternatives to the experience—that is the definition of comfort to me. That being said, comfort is a placeholder for a bigger understanding of what we want to achieve as climate engineers. Any designed space should create the possibility for a better and healthier environment by way of its indoor air quality, thermal comfort, daylight and acoustic conditions, along with their spatial qualities.

LM: Why is this important in the conversation of energy in buildings?
WK: It is universally assumed that maintaining these indoor conditions requires massive energy inputs. The way we define comfort plays a significant role in this. Are the conventional targets to cool and condition spaces the only way to achieve thermal comfort? For instance, in the hybrid system (mixed-mode ventilation system) approach, mechanical systems for air-conditioning can be downsized substantially and energy demand can be reduced in the range of 30 to 50 percent without compromising thermal comfort and indoor air quality.

In the pursuit of comfort, buildings should be humble and respectful to their own environmental context. How much we use from the environment and what effectively contributes to our comfort needs to be balanced. A good building to me is one that does not waste resources, but takes what is given to us and to the planet at large responsibly.

LM: What is wrong with the way we make buildings today?
WK: What's wrong with making buildings today is that we mindlessly rush through design processes. We delegate decisions to suppliers of technology, systems and materials without taking our own jobs seriously. And


Photo by Patrick Bingham Hall 2

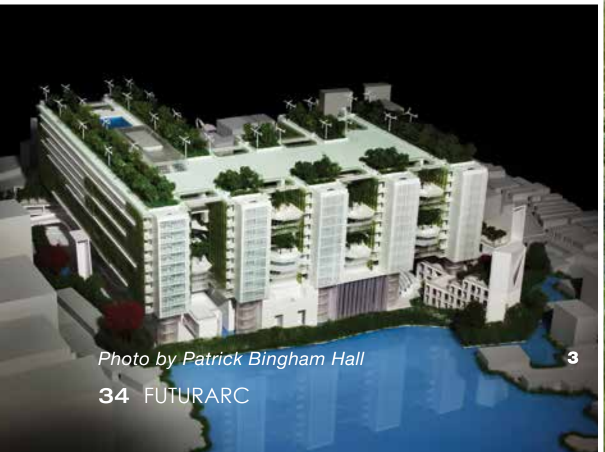


Photo by Patrick Bingham Hall 3


Image courtesy of WOHA Architects 4


5 *Image courtesy of WOHA Architects*

BRAC University Bangladesh, WOHA Architects, Singapore

The building is designed with plenty of open breezeways, contributing to about 40 percent of the area that are naturally ventilated, semi-enclosed spaces. About 75 percent of the enclosed areas are designed for hybrid comfort. The total electrical energy demand is reduced by about 40 percent compared to conventional design. About 25 percent thereof will be contributed by photovoltaics.

Lycée Français Charles de Gaulle in Damascus, Architects Atelier Lyon, Syria, 2008

The school is designed to be attuned to the local dry desert climate, and to rely predominantly on passive design strategies to achieve the required comfort levels. The design optimised classroom ventilation using passive strategies and removable shading devices, and created a microclimate in the courtyards that are usable by students and teachers.

6 Lycée Français Charles de Gaulle in Damascus, Architects Atelier Lyon **7 & 8** Climate/energy concept for classrooms at Lycée Français Charles de Gaulle in Damascus **9** Courtyards at Lycée Français Charles de Gaulle in Damascus, Architects Atelier Lyon

Avasara Academy

The campus is an organisation of simple structures arranged around an informal series of walkways, courtyards, gardens and terraces perched on an agrarian hillside. The dormitory and school are organised with two lower classroom floors and student faculty dormitories on the upper two floors. Within a limited budget, the building reckoned a comfortable studying environment without the use of mechanical conditioning systems in the humid, warm climate context of western India. Passive design was strategised with an optimised cubature, strategic zoning, horizontal projections, and locally made wooden sunscreens. The natural ventilation concept imbibed by the building structure creates an amiable indoor climate that is conducive for interactions and knowledge sharing. Outside air is sucked in through earth air channels where they are passively pre-cooled or pre-heated before supplying to the indoor spaces. Materials like polished concrete and open stone surfaces open the thermal storage mass in the rooms, contributing to the radiation climate inside the building. The exhaust air from classrooms and dormitories is held centrally in shafts and led directly into the solar chimney vents over the roof. The solar chimneys drive the entire airflow within the building. The integrated passive energy design concept reduced the initial construction cost by 7 percent due to non-reliance on mechanical air-conditioning methods.

PROJECT DATA

Project Name
Avasara Academy

Location
Lavale, India

Completion Date
12 May 2016

Site Area
4.3 acres

Gross Floor Area
11,148 square metres

Client/Owner
Leadership Foundation of India

Architecture Firm
Casedesign

Principal Architect
Samuel Barclay

10 Avasara Academy, India **11** Classroom interiors at Avasara Academy, India **12** Solar chimneys and BIPV at Avasara Academy, India **13 & 14** Ventilation diagrams

Photo by Adrià Goula Sardà 6

10 *Photo by Ariel Huber*

11 *Photo by Ariel Huber*

12 *Photo courtesy of Casedesign Architects*

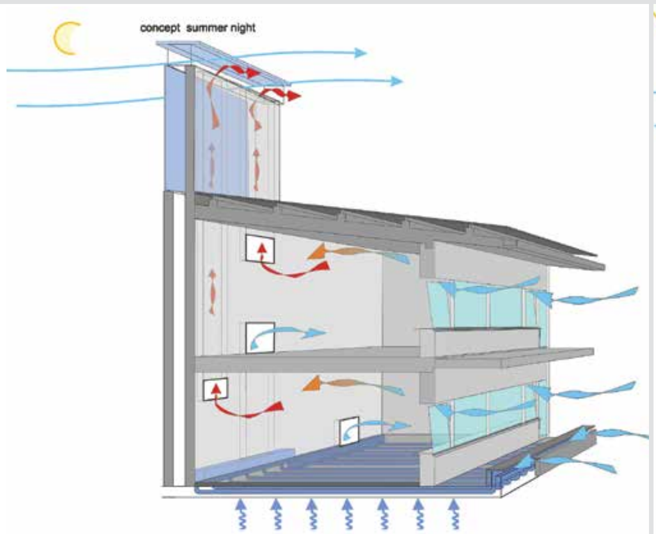
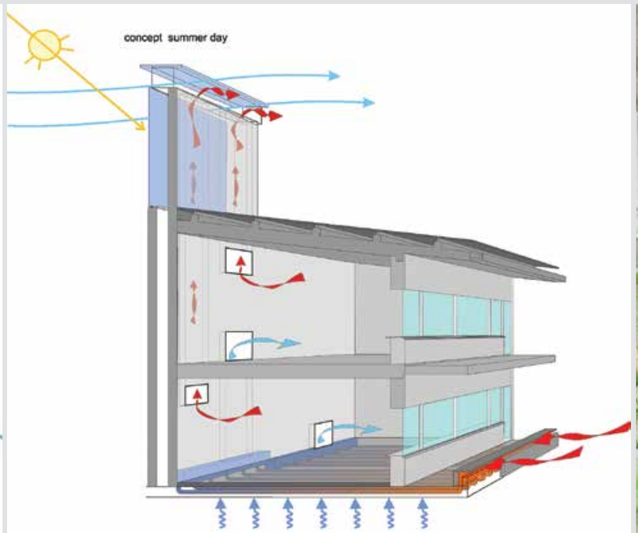


Image courtesy of Transsolar Energietechnik GmbH 7



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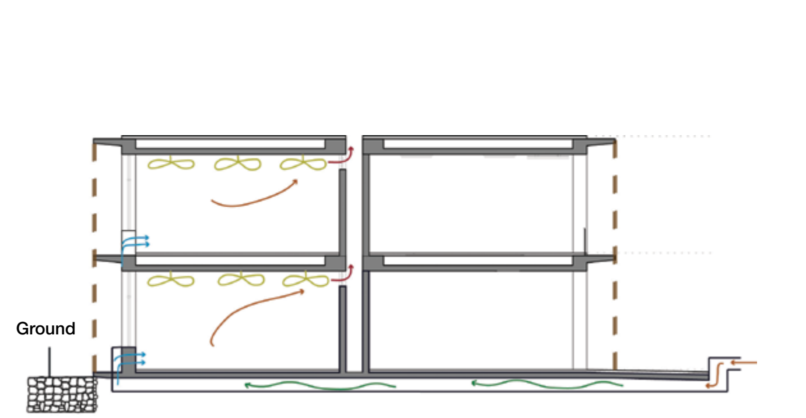

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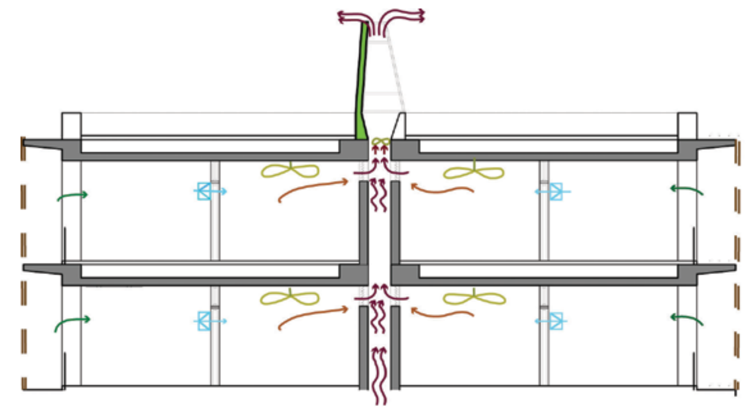

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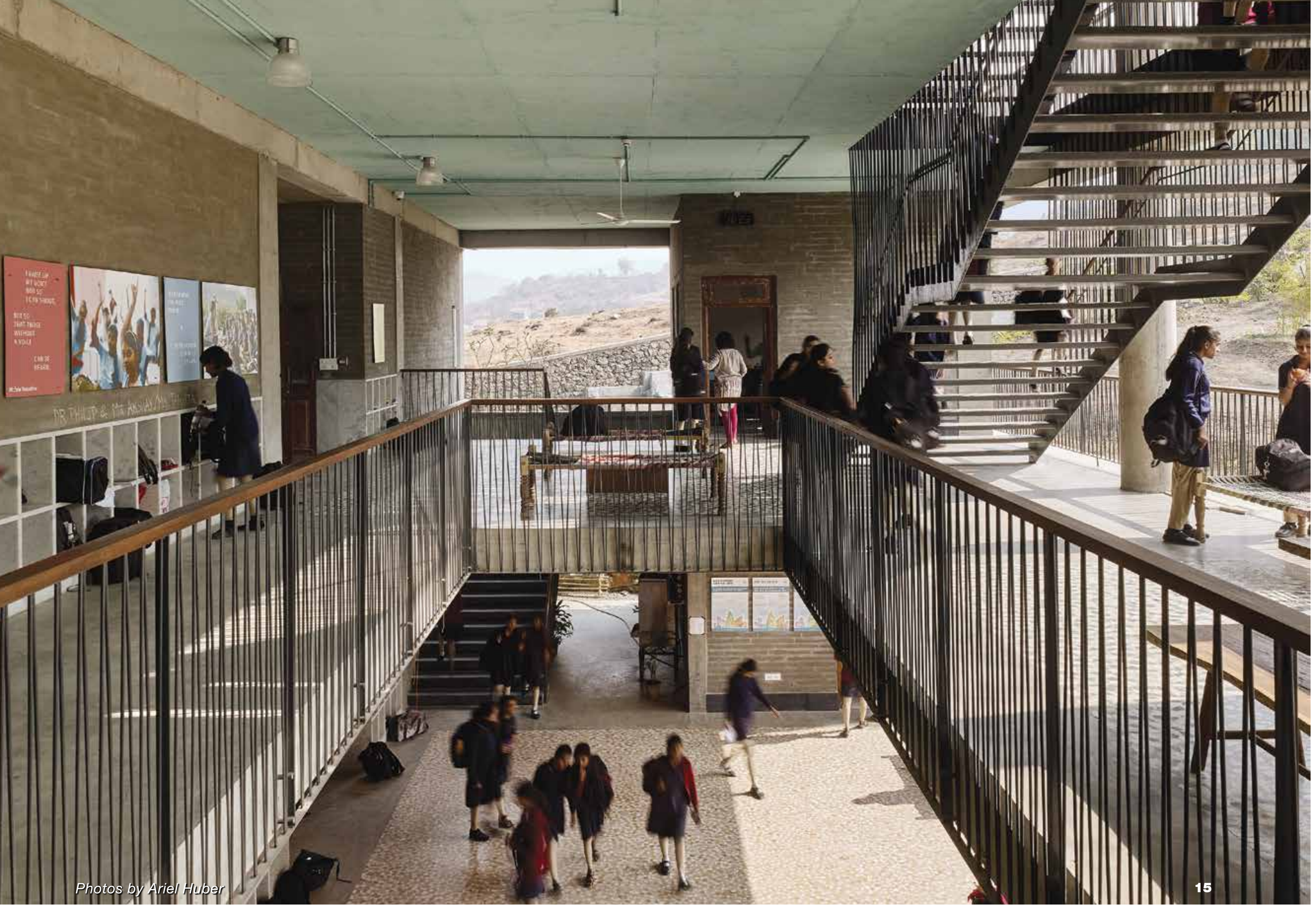

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I understand my role to be that of a facilitator—to combine the architectural vision with systems and material properties. Our mindset is directed towards sustainability; in creating environments that are comfortable but low in energy consumption.

we base our design decisions on the best assemblage of prototypes available in the market to reach a goal. But by rushing through a design process, we very often miss the opportunity to innovate and do things better. This needs to change.

This is where the integrated design process allows improved ideas to take shape. It'll take a little more thinking during the conceptual phase but the output would be way more specific to the requirements of the project.

LM: How is your work with Transsolar changing this paradigm?
WK: At Transsolar, an integrated design process incites constant revisits to the original design. With every design iteration, we seek to reach the targets with the best possible combination of materials and other resources. This process generates a clear catalogue of requirements and performance specifications that will guide contractors to implement them during construction phase.

That said, not all projects allow us to do that. Not all contexts allow us to follow our work dictum. The integrated design process is anchored in a European mindset, if I were to say. Asia works at a different scale and pace altogether, befitting their priorities. We notice that in most of our Asian projects, the schematic designs are done within weeks and not revisited. This mode of working needs to be addressed to make buildings more sustainable and resource efficient.

LM: Sustainability is a universal need. But the delivery of sustainability is contextual. Having done projects in contexts like Bangladesh and Damascus, how different have your approaches been?
WK: Rooting the building in its context is the most significant design decision to take. Western architecture is mindlessly copied across the world. This is the easy way out in which they don't challenge the design to perform contextually. Western ideas about comfort and how this is achieved with technology are far removed from the tropical Asian context. In terms of the availability of resources such as money, materials and technical skills, I particularly found this context interesting. It requires intense research to formulate designs that utilise lesser resources, providing us opportunities to rethink the norm of building. How can we achieve the desired quality of comfort with what the regional context provides? So this is something we did with BRAC University, which is a role model for adaptive comfort design.

I think having fewer resources is a great opportunity. The act of design becomes a large resource in itself; an intellectual resource that will shape the design proposition challenged only by the resources that you have. Here, one will strive hard not to copy template designs, put a lot of machines in them and fix the discomfort that ensues.

LM: Did this challenge bring you to the tropics?
WK: That is an interesting question. As I mentioned earlier, my initial 10 years of practice were about solar air-conditioning systems. The hot, arid and humid conditions were ideal contexts to employ those systems. In doing so, I've realised my interest to interpret building energy systems as an outcome of different climatic contexts. The design permutations one has in warm and humid environments particularly are vast. One can live comfortably being indoors or outdoors, and this steeps deeply into their culture as well. Our projects respect this ideology and attempt to break the separation brought about by building envelopes.

LM: Global warming and climate change are impending issues on the planet currently. Who holds the power to bring in the big change?
WK: Big change is possible by reducing our consumption, by rethinking designs to perform better with less. If the quality of the indoor air, thermal comfort, daylight, good acoustic conditions, spatial qualities, etc., can be achieved with low-tech and low-energy intensity, then I don't see why it should not be the next big change.

With every project at Transsolar, this is what we attempt to achieve and replicate in essence. However, catalysing this process, by way of education, can trigger global impact. Transsolar Academy was founded with the idea of inspiring and laying the grounds for future architects/engineers to look at energy systems holistically. Every year, we receive fellow students from across the world. We support their knowledge with our expertise that they then take back to their countries and impact positive change.

15 Atrium at Avasara Academy, India
16 & 17 Locally made wooden sunscreens of Avasara Academy, India