THE FUTURE OF ENVIRONMENTAL DESIGN

ENVIRONMENTALLY SENSITIVE BUILDING DESIGNS

By Ian Bogle

When I was born there were three billion people on the planet. Four decades later there are now more than seven billion. The way that we live, work, and communicate continues to increase global consumption of energy at an alarming rate. The idea that there are data centers all over the world using energy to cool the servers that store the information is in many ways ironic, given that most of it is simply 'hot air' – the everyday communication of social media.

So as designers we have a responsibility to challenge the norm and provide our clients and stakeholders with buildings and places that respect the immediate and wider environment. While we cannot avoid energy consumption, the challenge we face is to design carbon neutral buildings which do not adversely impact on the environment.

WE LIKE TO REFER TO THIS AS ENVIRONMENTALLY SENSITIVE DESIGN

So much of this is about education. The way we use our spaces and places, both internally and externally, impacts our wellbeing and affects our health. Our work in the Far East has led us to collaboration with Vanke China Ltd. on the design of China's first BREEAM (Building Research Establishment Energy Assessment Methodology) 'Outstanding' project – The Beijing Green Building Park Visitors Centre. This project is a 'tour de force' in both passive and active environmental design.

Passive in that the building uses very little energy in the first instance. Building orientation is the simple solution to addressing the initial problems allowing daylight from the north and solar control on the south façade. The spaces are naturally ventilated; daylight provides the main source of light (only task light-

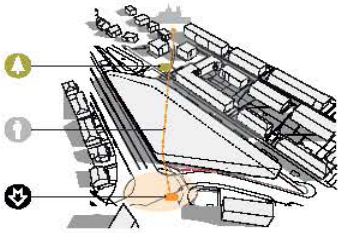
ing and emergency lighting are provided) and the south façade is shaded from the high summer sun but allows passive solar gain into the 'buffer zone' during the winter months. The active solutions are the recycled cooking oil which powers the boilers to provide heating in the winter, and absorption chillers which provide cooling in the summer months through the radiant concrete ceiling panels. The entire building is built into the landscape with the roof providing a dual function – providing super insulation and accessibility for the public.

Finally, to encourage recycling, we have developed a cladding system which uses recycled water bottles in the north façade to show the population that even the simplest of elements can have a re-use value.

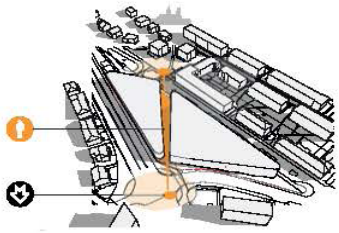
Our designs for the Mixed Use City project at Borislavka, in Prague, the capital of the Czech Republic, were defined by both building use but also public realm awareness. Being sensitive to the location and surroundings was as much a driver for the design as the client's brief for over 550,000 square feet of commercial real estate. The site had an urban 'desire line' across from a green park to the Metro station entrance and we used this existing pedestrian link as the feeder for a sequence of hard and soft public spaces. Around these public spaces we created the retail mall over the lower levels while providing four efficient commercial office buildings above the mall. These office buildings respond to the immediate urban context but are also subject to 'urban sculpting.' The forms are defined by providing natural light to the offices but also respecting the neighbouring buildings. The facades are then tuned to provide solar shading only where necessary to keep the solar gain 'outside' of the development reducing the overall cooling loads.

In Singapore, where there is a fairly constant temperature all year round, we were asked to design the largest Early Years School in the world. While this posed enormous logistic challenges, we worked alongside educationalists to provide a facility that would be both environmentally sensitive but also provide a distinctive educational offering for the users – small children.

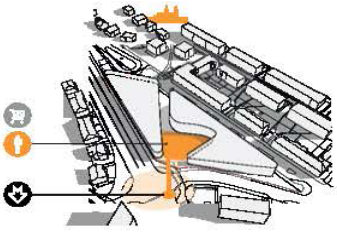
Cooling the internal space is inevitable in the humid environment of Singapore, however working alongside our MEPH designers, AECOM, we changed the classroom ventilation from the normal practice of ceiling mounted Fan Coil Units to an underfloor displacement system. This system delivers



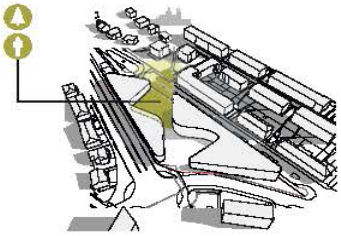
The desire to connect ...



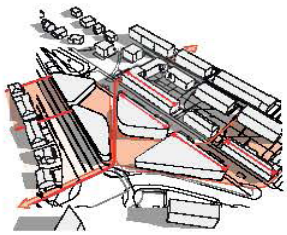
Forming a link ...



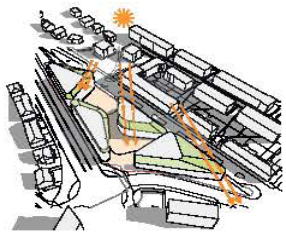
A space with a view ...



Connecting places ...

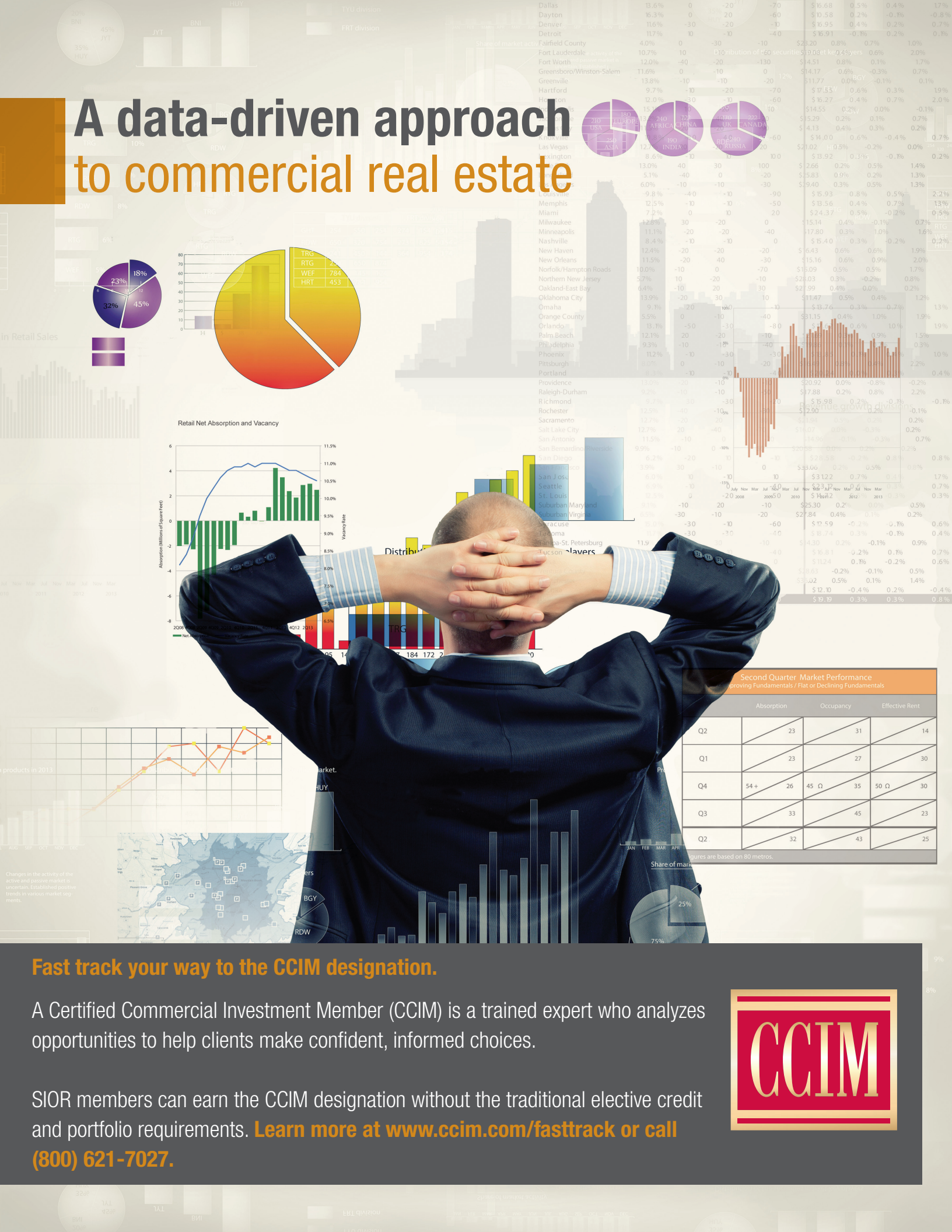


Connecting the streets ...



And the spaces above!

A data-driven approach to commercial real estate



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the air to the space at 20 degrees Celsius rather than the 14 degrees of the normal system, and as such, while base plant equipment sizes are bigger, the energy consumption is much lower and 'in the round' is delivered for the same cost as the normal system.

The building is covered with green walls which soften the appearance of this large building and also ETFE 'tree' canopies which offer comfort from the external elements. Both of these items are considered as strong educational 'identifiers' for the children but also provide the much needed ability for external play in the children's cognitive development.

From one place with fairly stable climatic conditions to another with extreme fluctuations. Moscow has a design temperature of minus forty to plus forty degrees. This posed many challenges, not least was the response to massive quantities of snow, when designing the 'Snegiri Eco' luxury residential project in the southwest region of Moscow.

This apartment complex is set around a green park and lake with the buildings orientated to maximise on the landscape integration with the park, but also to benefit from the short and long distance views – something rarely achieved in Moscow. Our solution here also included the idea of 'winter gardens' within the design of the residential units. These triple glazed spaces, through passive solar gain, provided the occupants with usable external space even in the depths of the long winters. These 'buffer' spaces create a habitable zone that is adaptable as a balcony in the winter and can become an extension to the living spaces in the summer months by retractable internal sliding screens.

Prior to establishing Bogle Architects, I was responsible for the first residential building in the world to have fully integrated wind turbines, providing direct energy for the buildings. In 2005 a directive by the Greater London Assembly dictated that all building over a certain size and floor area had to provide 10 percent renewable energy in situ. Our designs for Strata SE1 met this criteria by locating three 9m diameter wind turbines at the top of the structure. Harnessing the wind at an elevation of 150m high allowed this city centre development to meet the Local Authority requirements.

While an interesting solution to solving the energy consumption problem, through use of a natural resource, there are far more efficient ways to harness wind energy. Wind and solar energy production is more efficient on a larger industrial scale rather than building specific, however, it keeps the debate very much in the public's vision.

WHAT IS THE NEXT CHAPTER OF ENERGY PRODUCTION IN BUILDINGS?

Our design for The Extreme Light Infrastructure Beamlines project on the outskirts of Prague, which in 2017, will fire the most powerful laser in the world, is primarily exploring future laser use in medical research. However the same intensity of this particular laser is also being considered as part of a future programme, known as HiPER that will replicate the National Ignition Facility in California and, one day, will create fusion to drive turbines for energy production. This, in tandem with Renewable Energy solutions and education of the population on energy consumption, will go a long way to ensuring survival on our home – planet Earth. ■