Climatic Tower

A REACTION…TO THE CLIMATE CHANGE EMERGENCY

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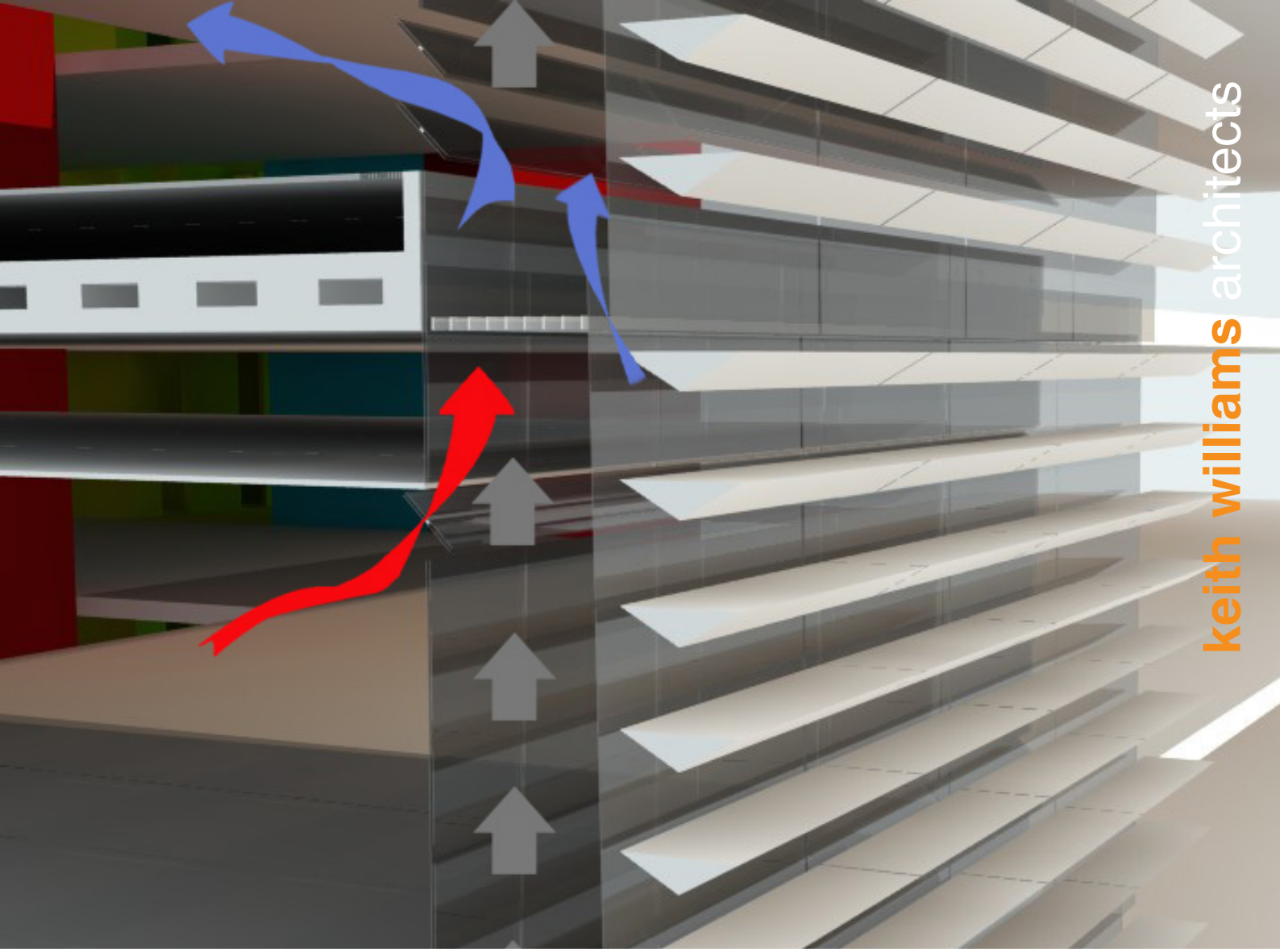
The Climatic Tower is a research project that offers challenges to clients, architects and engineers to radically recast their thinking so that the next generation of major buildings sit more lightly on the planet



Detail of the “Breathing Facade”

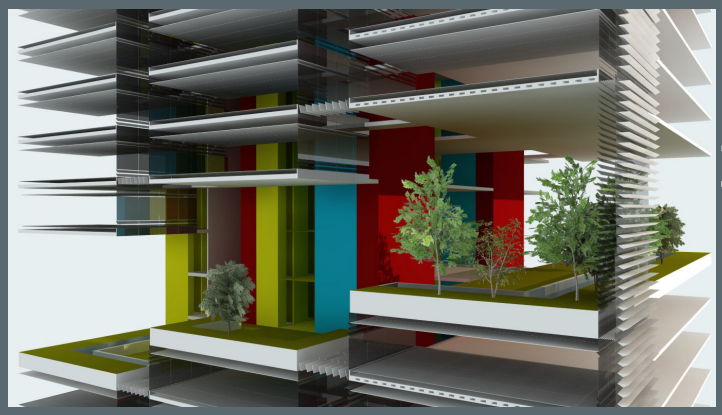
Facts & Figures

- Multi-use tower
- Height : 240m
- Storeys : 50+
- Area : 125,000m^2
- Offices : 50,000 m^2
- 5* Hotel : 200+ bedrooms
- Apartments : 200 apartments
- Conference/Cultural
- Retail/f&b spaces

Public Realm

- Public realm at top
- Public realm at ground level
- Centralised connections to transport infrastructure

Climatic Tower 2022



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Climatic Tower : Cross Section at 3 storey atrium

A REACTION TO THE CLIMATE CHANGE EMERGENCY

Keith Williams Architects have for 20 years, embodied sustainability and low energy principles as a fundamental element in the conception of all our buildings.

The Climate Change Emergency has however changed the landscape dramatically.

Our proposals for the Climatic Tower, a 50 storey 125,000m^2 mixed-use high-rise, envisage the ongoing densification of our cities as populations continue to grow, but have been designed with a fundamental emphasis on sustainability, net-zero carbon, the quality of the public and communal realms, and the health and well-being of its occupants.

Traveling the world we became appalled at the wanton energy consumption in so many environmentally disastrous tall buildings.

Huge buildings that took little account of their location or orientation, were often clad in glass skins and relied on energy hungry mechanical plant to make the uninhabitable.....habitable.

Such buildings are unviable and will likely become “stranded assets” both culturally and financially.

This to us was and is unacceptable.

We needed to find a more sustainable way of designing and making our buildings.

Initially developed with input from ARUP, the Climatic Tower does not have all the answers but it does set out many important principles and can be seen as a pathfinder toward a new lower carbon more sustainable way of making large scale urban buildings.

TIMELINE

ONGOING

BUILDING AREA

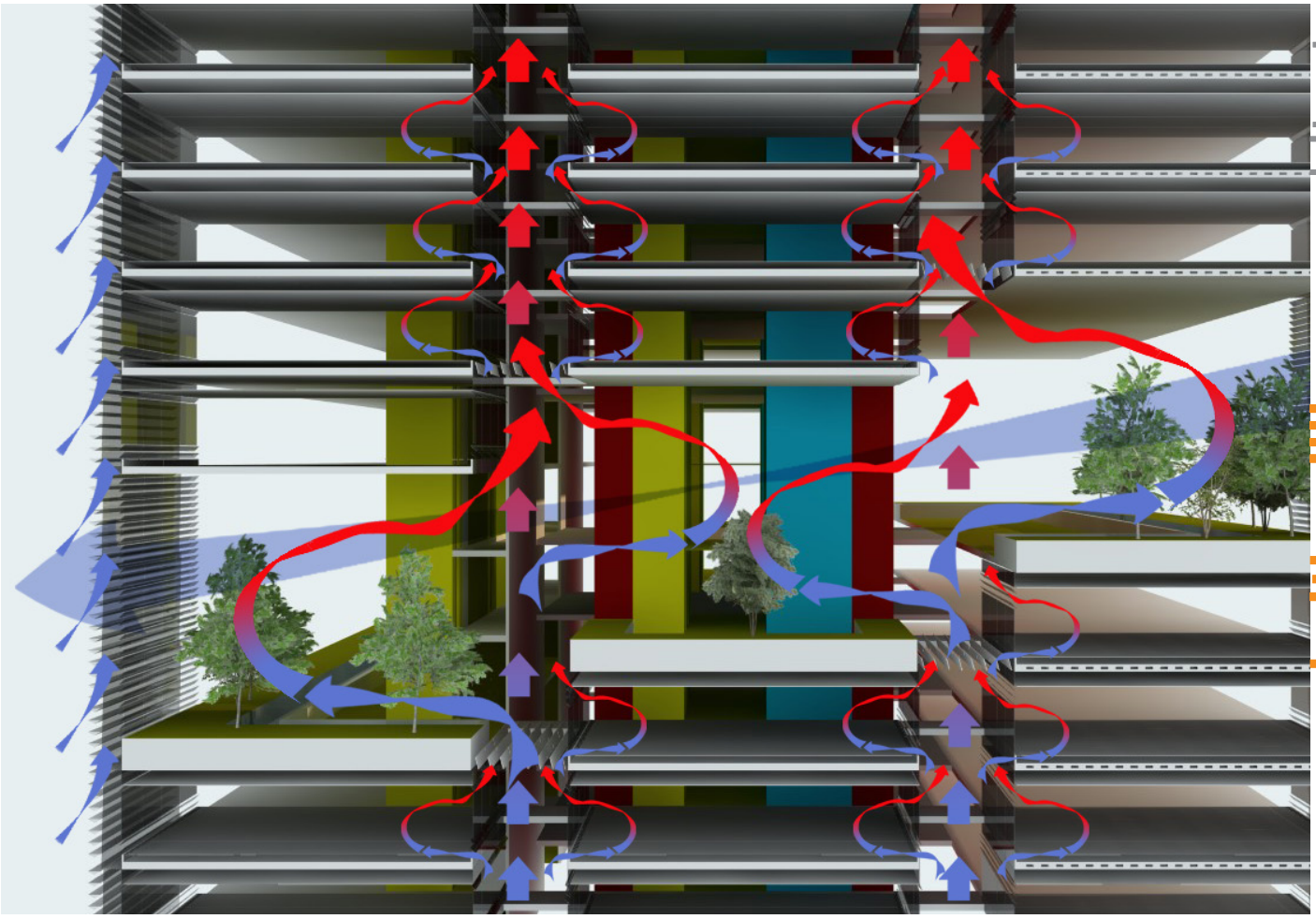
125,000 m^2

Z Section atria reorganise conventional planning to deliver natural ventilation deep into the building. Triple height gardens punctuate the façade bringing daylight and vegetation deep into the plan – greening the tower and contributing to experience, health and well-being of the occupants.

Engagement with the public realm at the base includes new cultural facilities and transport hub interconnectivity, centralising the tower within urban transport infrastructure.

The principles in the Climatic Tower apply to major buildings wherever they are located.

The Climatic Tower offers challenges to clients, architects and engineers to radically recast their thinking so that the next generation of buildings sit more lightly on the planet and come as close to net-zero carbon as is possible.



Cross Section showing communal green spaces, environmental strategy & breathing facades

Key Climatic Aspects

- Orientation generated design outcomes
- Climate responsive “breathing facades”
- Natural ventilation
- Screening the glazing
- Photovoltaic glass (PV glass)
- Greening of the tower – vertical gardens
- Communal green spaces at intervals up the tower – contributing to health and well-being
- Winter gardens
- Generous storey height to facilitate adaptive re-use and building longevity
- Active public realm at the base including new public gardens, cultural facilities and transport hub interconnectivity

RATIONALE FOR THE CLIMATIC TOWER

Firstly we asked ourselves whether we will continue to need buildings of this scale and complexity.

The world population in 2020 was close to 8 billion with projections indicting 9.8 billion by 2050.

The widely held assumption is that much of the population increase is likely to happen in cities requiring a densification of the urban condition.

To avoid untenable urban sprawl, tall multi-use buildings will be needed to accommodate population growth.

So yes we will need such high density buildings.

Secondly we asked ourselves whether these necessarily complex buildings can be constructed without concrete and steel, relying perhaps on timber.

We have concluded probably not.

Even if the technical issues of structural stability and fire resistance can be solved, it is not likely that enough land worldwide can be made available to grow timber in the huge quantities needed globally whilst also leaving enough space for food production and natural biodiverse habitat.

Whilst we envisage the inclusion of timber in this project, it is clear that society has to recalibrate the amount of steel and concrete it uses, whilst at the same time recasting the composition and means of manufacture of these major constituent materials of the built environment.

There are clear roadmaps for Cement Decarbonisation and Steel Decarbonisation as separate endeavours which give us confidence that these things can be achieved, enabling these vital structural materials to be deployed in a new way.

To give substance to our premise, we have summarised some of these findings overleaf.

DECARBONISATION : CEMENT

Cement Production

As a key input into concrete, the most widely used construction material in the world, cement is a major contributor to climate change. Each year, more than 4 billion tonnes of cement are produced, accounting for around 7-8 per cent of global CO_2 emissions.

Rapid decarbonisation is essential

Cement Decarbonisation Roadmap

3 Major Decarbonization Routes for Cement to Net-Zero Co_2

Maximum CO_2 emissions reduction potential to 2050

			CO2 Reduction Potential
1	Demand Management	Designing Building More efficiently	-34%
		Recycling un-hydrated cement	
		Reusing concrete	
		Substituting concrete with timber	Uncertain
2	Energy Efficiency	Switch to dry kilns	-10%
		Multi-stage cyclone heaters	
		Decrease of clinker to cement ratio	
3	Decarbonisation technologies	Gas (transition fuels)	-50%
		Biomass/waste for heat generation (localised)	-100%
		Carbon capture on production and process emissions	-90%
		Belite low carbon clinker	-10%
		Pozzolan based concrete	-70%
		Cement-less concrete	-100%
		Kiln electrification	-100%

Source: Value(s) by Dr Mark Carney published by William Collins 2021

DECARBONISATION : STEEL

Steel Production

Steel production is similar in impact to cement and is also responsible for around 8% of global CO_2 emissions.

Technological Landscape for Decarbonization in Steel Production

Adopting an approach combining scrap, DRI (direct reduced iron), and EAF (electric arc furnace) using "green" hydrogen fuel is currently considered the most viable option and the long-term solution to achieving carbon-neutral steel production.

Source: Value(s) McKinsey & Co June 2020

Steel Decarbonisation Roadmap

6 Major Decarbonization Routes for Steel to Net-Zero Co_2

Maximum CO_2 emissions reduction potential to 2050

1	**Design Efficiency**	CO2 Reduction Potential	**-17.5%**
2	**Circular Economy**	CO2 Reduction Potential	**-15%**
3	**Steelmaking Emission Reductions**	CO2 Reduction Potential	**-28%**
4	**Decarbonisation of Electricity Grid**	CO2 Reduction Potential	**-6.5%**
5	**Carbon Capture**	CO2 Reduction Potential	**-25%**
6	**Steel Transport Fabrication & Erection**	CO2 Reduction Potential	**-8%**

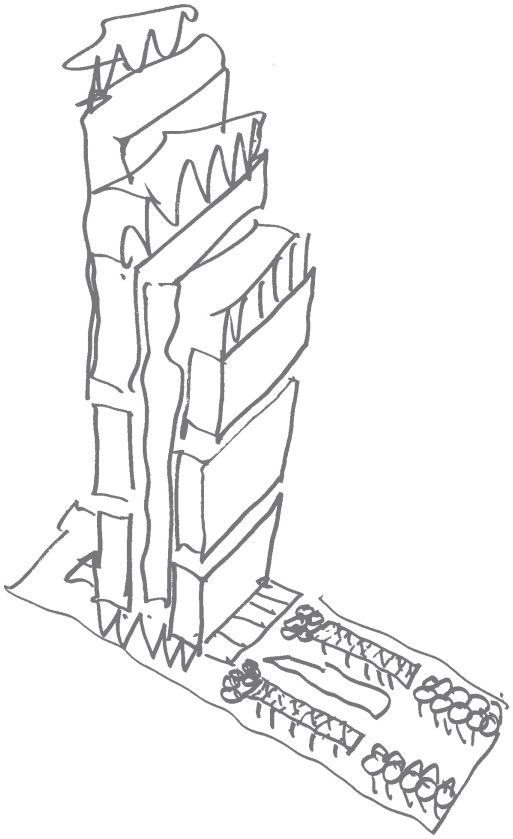
Source: BCSA UK Structural Steelwork: 2050 Decarbonisation Roadmap

Steel and Cement producers are major emitters of CO_2 but they are not alone. These roadmaps set out strategies for design efficiency, material quantum minimisation and a radical overhaul of production methods needed to ensure that we can continue to deliver buildings for human need whilst ultimately zeroing carbon emission.

Similar procedures need to be applied to other major CO_2 emitters such as brick, aluminium and glass manufacture to ensure that clients, architects and engineers have viable materials to work with to continue to provide the buildings that society demands.

Whilst other bodies such as scientists and engineers at Imperial College continue to research toward not only zero carbon but zero pollution.

This project is an important test bed for our ideas and the work that we do informing other live projects that we are working on in the studio



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We remain optimistic that we will find the means to at last build in a manner that does indeed tread a little more lightly on our planet

After all it is the only one we have and we need to treat it carefully

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